FLIGHT
The AIRCRAFT ENGINEER & AIRSHIPS

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Sept. 12 .... Italian International Meeting
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Oct. 24 .... Aero Golfing Soc.—"Cellon" Challenge Cup
1929
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EDITORIAL COMMENT

THE veil of secrecy which has hitherto surrounded the new airship R.101 was partly lifted on Thursday of last week, when a group of press representatives visited Cardington to inspect the work being done there. Maj. F. A. de V. Robertson is giving an account elsewhere in this issue of his impressions of the visit and of the new airship. The occasion seems appropriate for referring, quite briefly, and in a very general way only, to the latest book by that avowed disbeliever in airships, Mr. E. F. Spanner, who, not content with the attack on airships made in his book some time ago, entitled "This Airship Business," has returned to the attack quite recently with another book which he calls "Gentlemen Prefer Aeroplanes." This title was humorously suggested by Mr. J. D. North on the occasion, we believe, of Mr. Wallis's paper on R.100, the Burney airship. Mr. North then said he thought Mr. Spanner had made a mistake in the title of his earlier book; he should have put it in a bright attractive cover and called it "Gentlemen Prefer Aeroplanes."

Some "Gentlemen prefer Aeroplanes"

In his latest book Mr. Spanner devotes considerable space to the subject of passengers and their comfort, and he backs up his case by quoting extensively from the log of R.34, drawing pictorial diagrams of the airship pitched at various angles "up by the nose and down by the nose," and in order to bring home to his readers the horrors of such angles of pitch he gives, by way of comparison, diagrams of the *Mauretania* pitched to the same angles. The conclusion Mr. Spanner draws is that the airship passengers would be desperately uncomfortable, while a liner like the *Mauretania* would never be pitched to such great angles. That is probably perfectly true, but on the other hand, a liner rolls very considerably and in doing so probably attains quite as great angles of roll as any angles of pitch ever reached by an airship. Moreover, if an airship is pitched either up or down by the bows, she usually remains so pitched for very considerable periods, while the liner in a cross sea changes her angle of roll from one side

to the other within a few seconds, a state of affairs which is surely much more uncomfortable for the passengers.

Mr. Spanner also makes much of "bumps" (for some unexplained reason he persists in calling them "dunts"). Well it is, of course, perfectly true that all aircraft types, both heavier-than-air and lighter-than-air, are subject to "bumps," but even very bad "bumps" are less serious in their effects on passengers than are the movements of surface vessels. There are thousands of people—quite a large number among our own personal acquaintances—who are never troubled with sickness in the air, but who suffer from seasickness every time they travel by steamer.

On the technical side Mr. Spanner has much to say, but when one comes to look into the matter it is found that the whole of the arguments boil down to this: that his criticisms are merely expressions of personal opinions; they are *not* proofs. In fact, without being in full possession of all the information concerning the large airships now building, it is impossible for anyone to do more than form opinions.

Without knowing every detail one is not justified in claiming for such criticisms more than the weight of a personal opinion. Thus, put very briefly indeed, it comes to this: On the one side we have Mr. Spanner saying "I don't regard this as being sound." On the other we have technicians who have studied the subject very closely and for many years (in spite of Mr. Spanner's rather sneering attitude) and who as a result of their work and studies say "We do think it is sound."

Admitted that there may be, and probably are, stresses in such complicated structures which cannot be calculated exactly but must be estimated as closely as possible, we personally should prefer to accept the views of the airship designers rather than those of Mr. Spanner. Time alone can show which side is right. That the new airships may not realise all the expectations is very possible, but that they are unduly weak, and dangerous in other ways, we refuse to believe. After all, those responsible for the designs are aware of their responsibilities, and we are quite sure that they have not undertaken them lightly. And to abandon the whole airship programme, as Mr. Spanner suggests that we should, now that the airships are nearing completion, would be to lose the chance of finding out whether or not the large airship is ever likely to be a useful type of aircraft. Things have progressed too far for such a course to be advisable, or even possible.

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The Motor Cycle of the Air

It is a somewhat curious fact that although the light 'plane movement began with light single-seater machines fitted with motor-cycle engines, the low-power machine of this type has disappeared altogether in this country, and the two-seater of about 90 h.p. has taken its place. So much so that at present nobody appears to consider the possibilities of the single-seater type at all. Yet it is not unlikely that a potential market for such a machine exists, and curiously enough, chiefly as a result of the popularity of the two-seater light 'plane.

As a result of the excellent work done by the British light aeroplane clubs, there have come into existence during the last year or two a large number of young men (and quite a few women) who have obtained their pilot's certificates, but who are, for financial reasons, debarred from continuing to fly, or at least whose flying is confined to an occasional hour or half-hour now and then when a club machine can be secured.

The £650 or so, however, which the present two-seater light aeroplane costs is quite beyond the majority of these young enthusiasts, and if they look around, as many of them do to our knowledge, for something cheaper, what do they find? That not a single manufacturer has anything to offer. Perhaps occasionally a bargain in second-hand machines may be picked up, but the percentage of cases in which that happens is—at present—very small.

We should be the last to suggest the possibility of reviving the motor-cycle-engined single-seater of four or five years ago, but it does seem a pity to stir up enthusiasm in a lot of young men, merely to leave them disappointed and disheartened because of lack of flying opportunities once they have got their pilot's licence. We do think, however, that there may be more in the small single-seater machine than many people imagine.

Surely it should not be outside the bounds of possibility to produce for somewhere between £250 and £300 a little single-seater with an engine of 40–45 h.p.? Such a machine, we know, can be a real aeroplane and not an underpowered toy. Take, for example, the D.H.53 when fitted with the Bristol "Cherub," or the A.B.C. "Scorpion II." Both in quickness of get-off, climb and speed this machine has a very good performance. Granted that it may be a little sensitive and to require rather a good deal of skill on the part of the pilot, It should be possible to design something a little larger, perhaps, a little less sensitive, and a little more robust for working from rough ground. We believe that there would be quite a market for such a machine if it could be sold for a reasonably low figure. For every potential purchaser who can afford to pay £650 for a two-seater, there must be, we think, at least ten who can afford to pay £250 or £300.

We are aware that the two-seater came into being and reached almost instant popularity because it was a two-seater. Most pilots will prefer to carry a passenger, or at least to be able to do so when desired. But it seems likely that there will be a considerable number of young men who, if they are not financially able to attain their ideal in light aeroplanes—the two-seater—would be content with the next-best thing, the cheaper single-seater. At the present time they have no choice of a second-best.

The analogy with the motor cycle is not altogether valid because a motor cyclist is able to, and frequently does, carry a passenger on the "flapper bracket," but it is something like a "motor cycle of the air" which is wanted as an alternative to the extremely useful and popular but unfortunately somewhat expensive two-seater. It seems to us that the reasoning which a young man who has learnt to fly would use would be something like this: "I should like to buy a two-seater, but the price is beyond me. The single-seater has its drawbacks, certainly, but I can get it for less than half the money. It will have to be a single-seater."

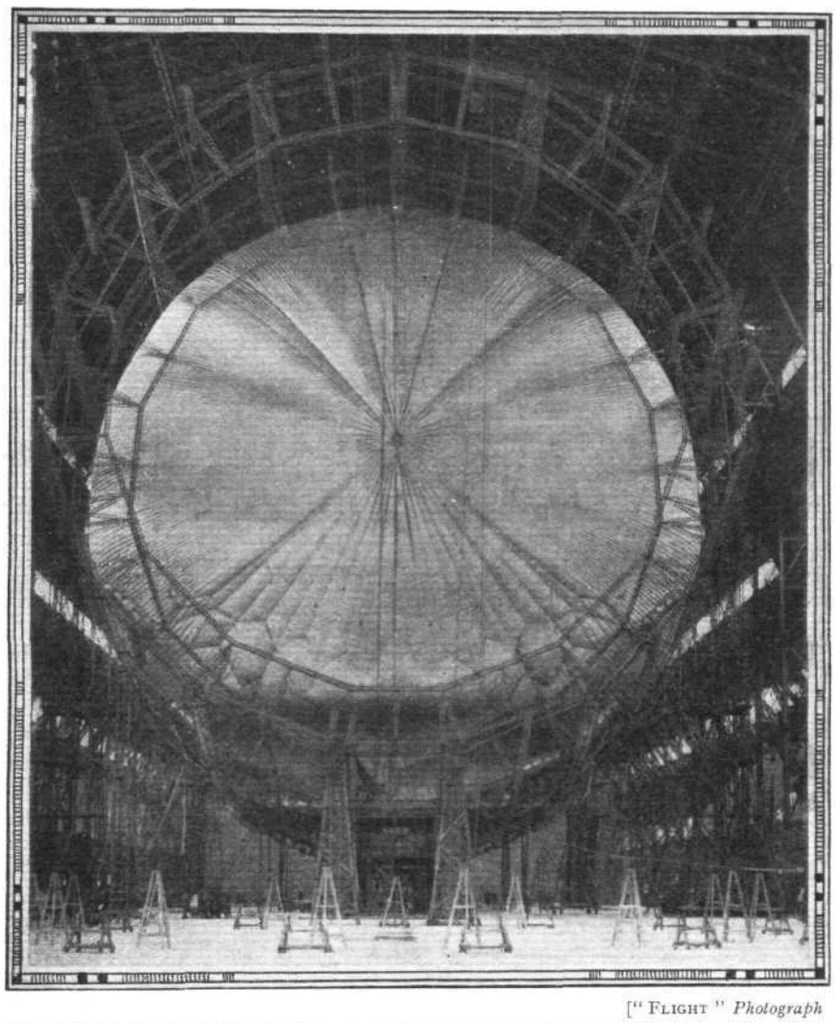
FLIGHT
AIRCRAFT ENGINEER AIRSHIPS

AIRSHIPS

His Majesty's Airship R.101

By MAJOR F. A. de V. ROBERTSON

To people who have kept in touch with the progress of the airship R.101 a visit to the Royal Airship Works at Cardington on Thursday, August 23, was quite a surprise. It had been known that the assembly of the framework was not being hurried on, and that a few months ago all that could be seen in the shed at Cardington was one transverse frame erect in position, and another in process of assembly on the floor. On Thursday, eight frames, numbered (from the nose) 3 to 12, were erect and connected up by sections of the longitudinal girders. The total number of transverse frames will be 15. In bay 9-10 was a gas bag almost fully inflated. In the lower portion of bays 6–7 and 7–8 the metal floor girders of the living compartments were in place and carpenters were fixing the ply-wood floor on top of them. In fact, R.101 is beginning to assume the appearance of an airship in skeleton, and it is now possible to get some idea of what she will look like when completed, and of what life on board will be like.



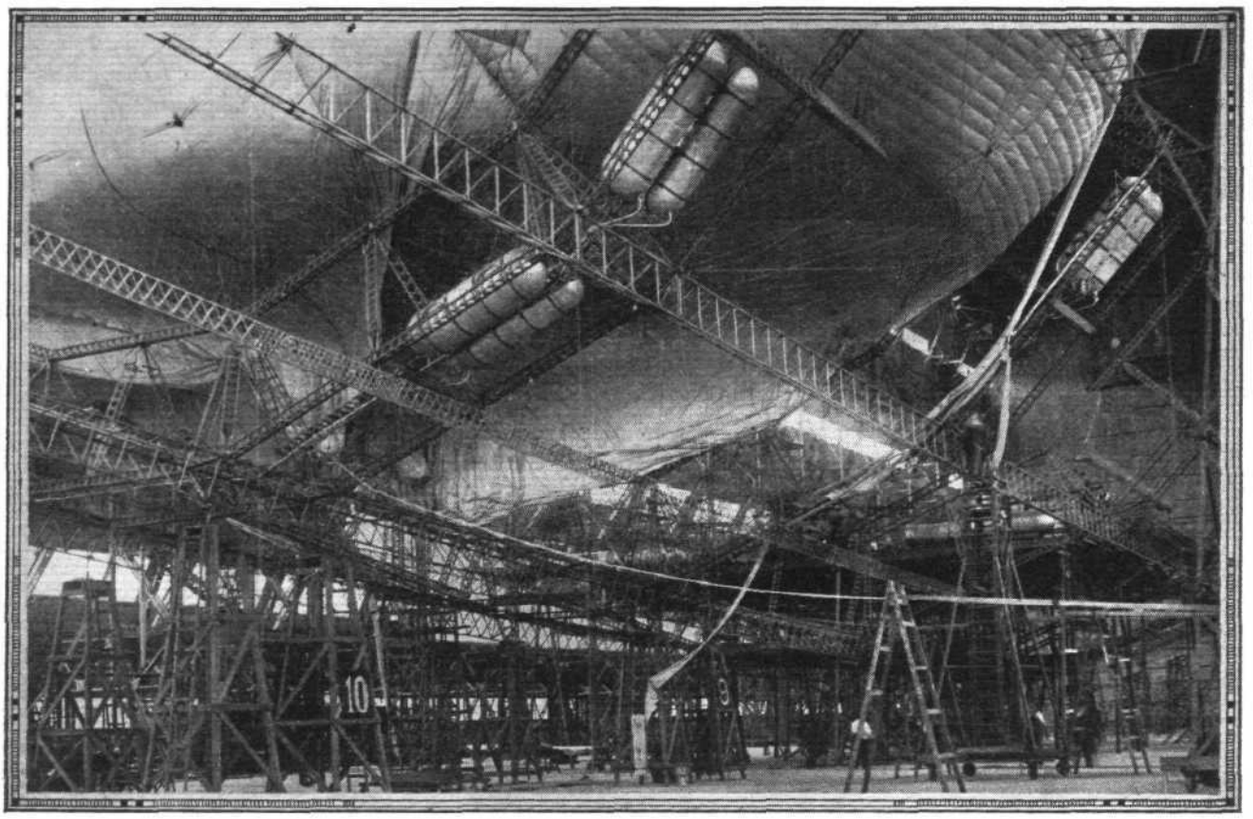
["FLIGHT" *Photograph*

EMPIRE AIRSHIP R.101: A general view of the half-completed airship being constructed at Cardington, showing one of the gas bags in position. R.101 is 724 ft. in length, and has a capacity of 5,000,000 cub. ft.

Though airships were more advanced than aeroplanes before the war, there has since been stagnation. At least there was complete stagnation until Sir Samuel Hoare decided to proceed with a programme of building experimental airships for commercial purposes. There were naturally many heart-burnings during those years of stagnation; and at the time it seemed deplorable that no one could be found to make use of R.33, R.36, R.37 and R.80. Airships have many unfriends, just as aeroplanes had for several years, and it was possible (and still is possible) for such people to say: "We know what aeroplanes will do, and we do not know what airships will do; so why worry about the latter?" But now we are able to see that all has been for the best. No commercial future could possibly lie before the Zeppelin type of airship of about 2,500,000 cub. ft., and radically novel methods of design and construction were not possible in that size. It would have done airships no good, and consequently would have done the commerce of the world no good, if efforts had been made to use the Zeppelin type for civil purposes. The disasters to the Dixmude and the Shenandoah have demonstrated that fact. The lift of an airship increases as the cube of its linear dimensions, while the weight increases only as the square of those dimensions, so it was only in large sizes that radically new methods could be adopted. For instance, it was not possible to use steel in a small airship; but in a ship of 155 tons displacement steel is lighter than duralumin for a given strength. We are now undertaking an experimental development which, perhaps, ought to have been undertaken some years ago; but each year has meant that more resources of science have been at the disposal of the designers. It is also a matter on which we may congratulate ourselves (and also the régime of Lord Thomson) that two ships of totally different design but similar specifications are being produced at the same time. A comparison of the two is certain to teach invaluable lessons.

One object has been steadily, one might almost say ruthlessly, pursued in the production of these two airships, and that is safety. Nothing has been sacrificed which can make for safety. In particular, considerations of safety have always taken precedence of speed of construction. Research has preceded every step. The public has at times manifested impatience, asking why so much money should have been spent with nothing as yet to show for it. The same question could be asked about every piece of lengthy and expensive research and experiment. If it shows a prospect of paying for itself in benefit to mankind, it ought to be undertaken, and even if the ultimate results are nil, still it would have been most reprehensible not to have made the attempt. In the case of these two airships, no knowledgable person expects that either of them will prove to be a craft to revolutionise, by itself, the communications of the Empire and the world. Their task is to prove the case of airships in general, to show that they can operate over oceans with safety and reliability. Once that point has been made good, the next step will be refinements to increase the paying load and the comfort of passengers, as well as to increase the speed. All this will doubtless mean larger ships, but once the main point has been proved, there is no doubt that, as Sir Alan Anderson of the Orient Steamship Line remarked, at an air conference at the Guildhall some years ago, plenty of people will want to run them.

It is from this point of view that one ought to examine R.101. One ought not to expect that she will be the grand drama, but we hope that she will be the curtain-raiser to that drama. One can see plenty of points in her which need improvement, but not one of them decreases her factors of safety. Progress has been made in producing a substitute for goldbeater's-skin as a gas container. It is a very desirable innovation, but it was not worth while waiting for its development. Goldbeater's skin is expensive; but the most economic thing to do was to use it for R.101, rather than delay the great point of proving the principle of airships. The Beardmore heavy-oil engines are heavy—7 to 8 lbs. per horse-power. But that does not endanger R.101, it merely reduces her paying load. So she will fly with those heavy engines instead



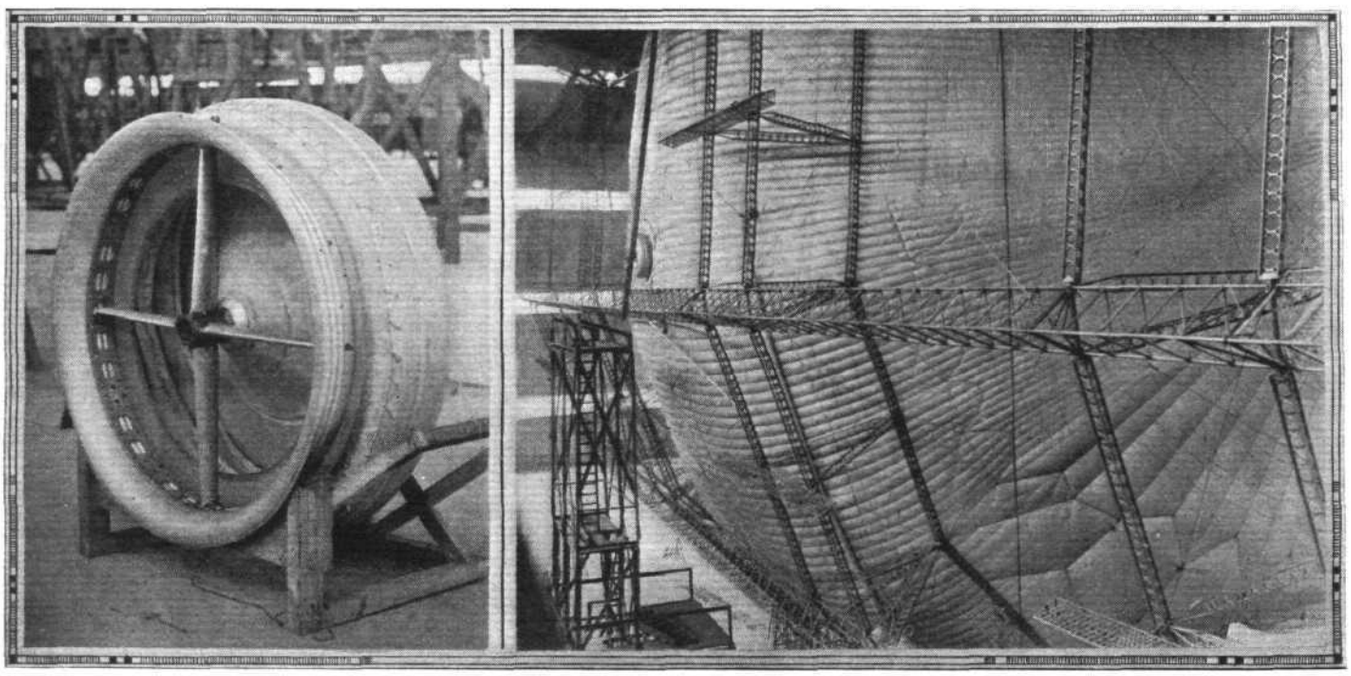
["FLIGHT" *Photograph*

R.101 : View of bays 9 and 10, showing the girder work, gas bag, fuel tanks, and the position of the passenger saloon—the floor of which is seen extending across the hull on the right of the picture.

of waiting for lighter models, and so help to make flying safe in tropical temperatures.

The Framework of the Hull

Those who are not privileged to see R.101 until her outer cover is in place will have no opportunity of admiring the excellence and beauty of the steel work turned out by Messrs. Boulton and Paul, of Norwich. They will also be unable to study the simplicity of the joint devised by Col. V. C. Richmond. The Zeppelin joint became so complicated that it was almost impossible to calculate the stresses imposed on it, and it has completely disappeared from the design of R.101. The triangular girders of three stainless steel tubes with subsidiary duralumin work give an impression of lightness combined with strength which is just the impression which the framework of a rigid airship ought to give. The



["FLIGHT" *Photographs*

R.101 : The view on the right gives a good idea of the hull framework, and also shows one of the gas bags in position with its ingenious system of wire suspension. On the left is one of the gas release valves, which are mounted in the side of the gas bag, as seen in the right-hand view.

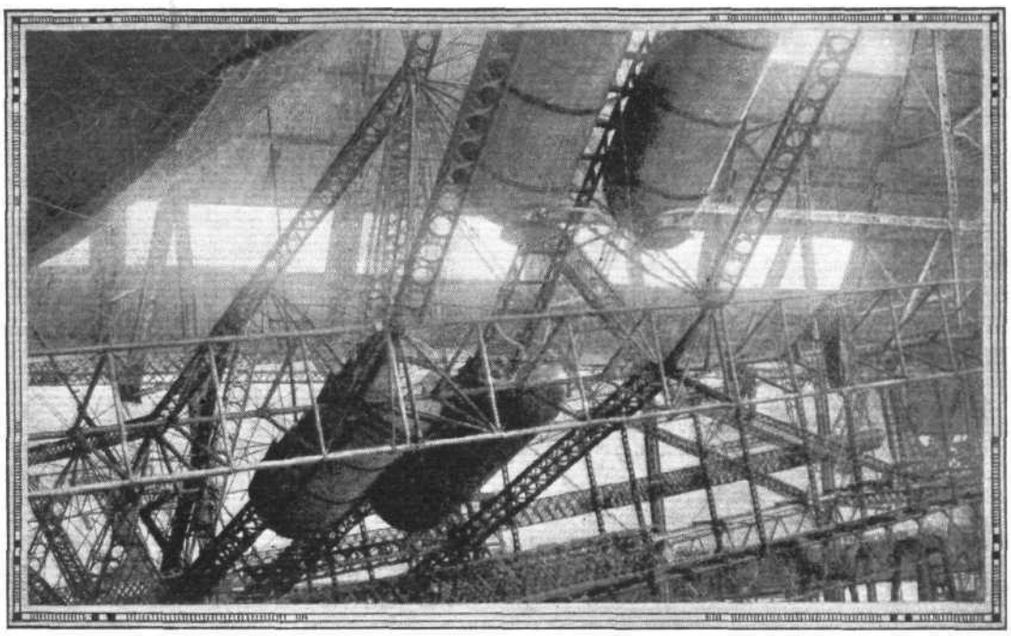
length of the ship will be 724 ft. 3 ins., and the number of transverse frames will be 15. The diameter of the largest frame is 131 ft. 8 ins., giving a fineness ratio of 5½ : 1. Each frame is stiff enough to dispense with cross-bracing wires, a great advantage in frames of such large diameter. A sample of one of the largest frames was hung from a single point and loaded at the bottom with 6 tons, yet the vertical extension was only about 4 ins.—quite a negligible amount.

Each frame is assembled on the floor of the shed, and the fuel tanks, piping, ladders, transverse gasbag netting, control leads, etc., are fitted into the ring while on the floor. Then it can be raised into position in about half an hour, and connected up to the next frame by sections of the longitudinal girders.

There are 15 main longitudinals but no keel member. There are also 15 intermediate longitudinals or reefing booms. In previous rigids the cover has been doped in place by hand and tightened by lacing. In R.101 the fabric will be doped first and then stretched into place. When it grows slack after some time of use, these booms can be pushed out on kingposts from the outside of the transverse frames to take up the slack. They also halve the unsupported span of cover between the main longitudinals.

The Fuel System and Ballast

The oil tanks, nearly all of which hold 224 galls. (1,870 lbs.) each, are disposed along the framework of the ship. A few



R.101 : This view shows some of the fuel tanks—with their release valves—and main girder work.

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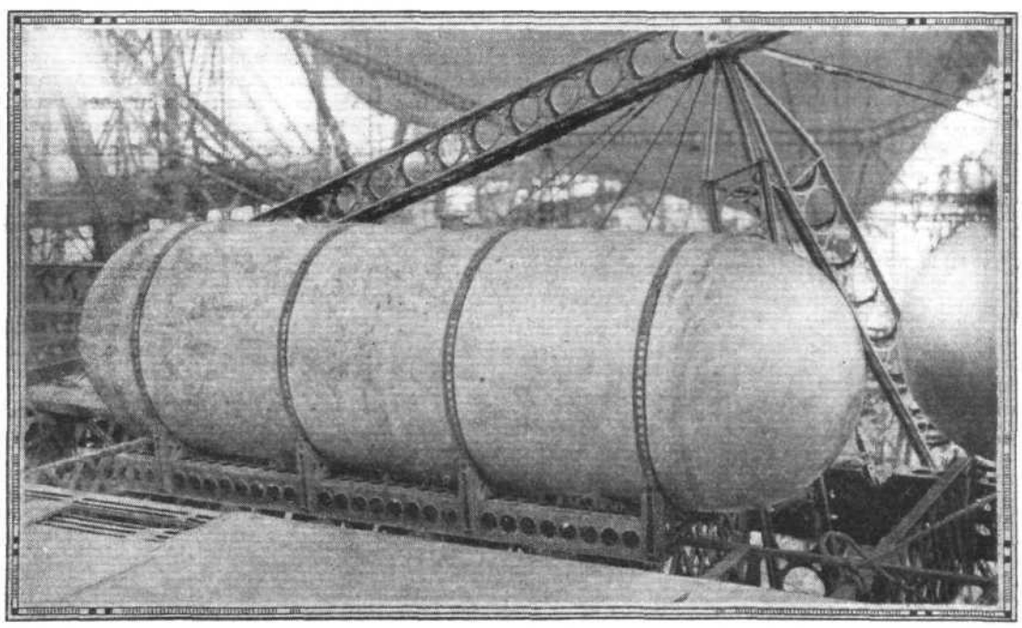
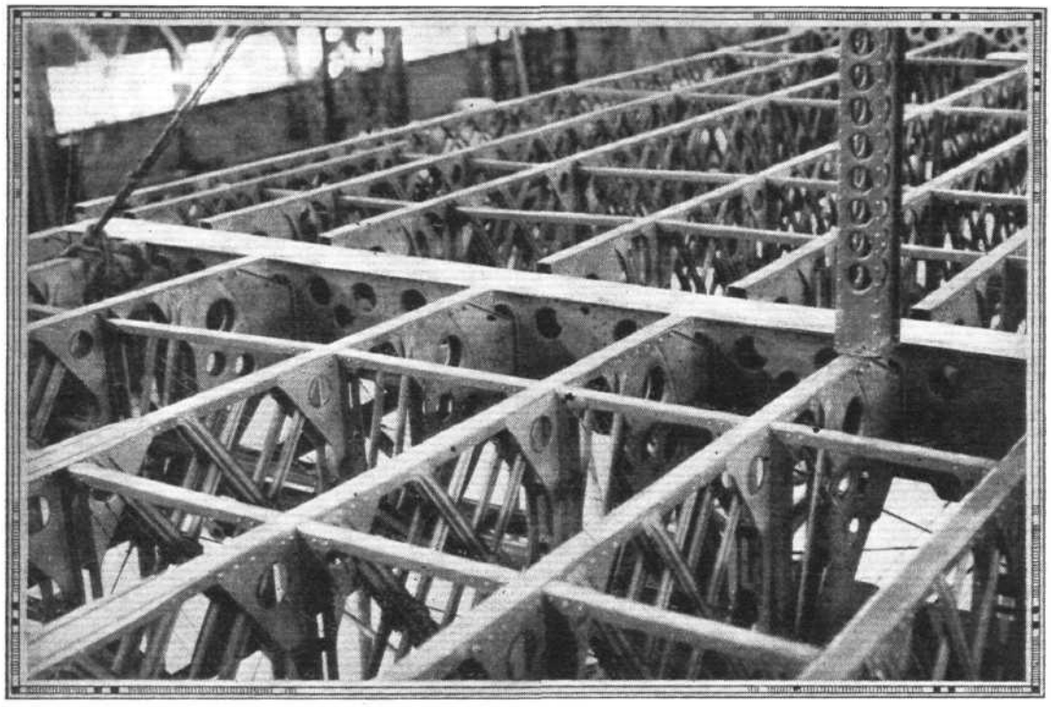


R.101 : A "close-up" of one of the fuel tanks, and also a typical joint in the girder work.

["FLIGHT" *Photograph*

This method makes for speed of assembly, and explains how it is that, once assembly started, the progress has been so rapid. When the day comes for "production" orders, this speed of assembly will be of very great importance. The three forward and the three aft frames are of different design from the remainder. Those at the nose have been designed with special reference to mooring strains, and those at the tail have to carry the four fins and flaps. Each of the flaps, by the way, is 44 ft. high, and to assist the coxswain in operating them auxiliary Servo-motive power will be provided. The machinery for this, which consists of Vickers-Janney variable-speed gears actuated by electric motors, is located in the bottom fin.

are of half the above size. A novel feature of R.101 is that the fuel from any of the tanks can be run down into special pressure tanks, whence it can be blown by compressed air to any part of the ship. A number of these tanks are disposed (and suitably screened) on the passenger quarters, so that if a number of passengers come on board or disembark, the ship can be trimmed accordingly. This movement of fuel weight will be operated from the control car. Including these tanks, the fuel capacity of the ship is 37 tons of heavy oil, but without the tanks in the quarters 29 tons. Certain of the tanks are fitted with special discs and circular cutters, so that they can be rapidly emptied in an emergency. Maj. G. H. Scott told me that only twice in his flying career



A specimen of girder work on the airship R.101. This supports the plywood flooring of the passenger saloon.

["FLIGHT" *Photograph*

has he let fuel go to lighten the ship, once from R.9 and once when taking R.34 for a trial trip over the Isle of Man.

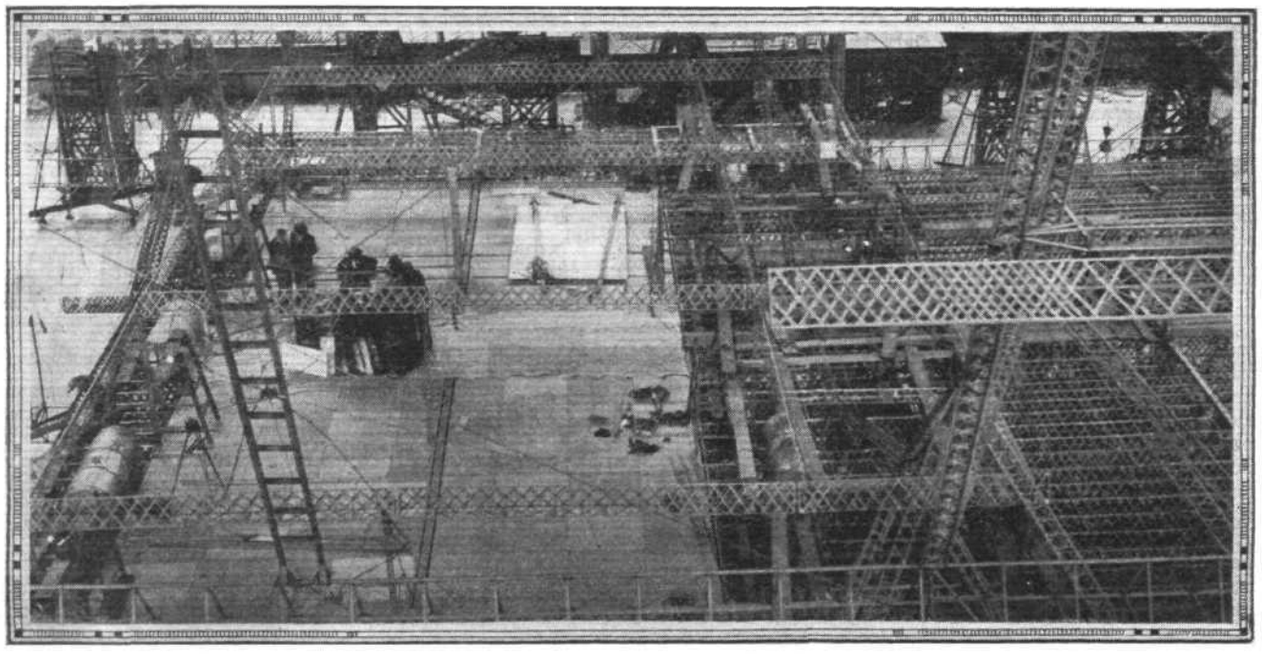
The normal ballast consists of 7 tons of water in emergency bags, from which it can be quickly released, and 8 tons in tanks like those used for fuel. The water in these tanks can, like the oil, be blown to any part of the ship. This provision of water ballast is considered excessive, and the water tanks may be used for fuel oil, bringing the fuel capacity up to a total of 45 tons.

Gasbag Wiring

The type of gasbag netting which is used on R.101 is also novel. It completely prevents a gasbag from touching any girder. The ends of the wires are brought down to the joints of the structure in such a way as to prevent any lateral strains being imposed on the longitudinals. In the event of one gasbag becoming partly or wholly deflated, the new conditions of pressure are distributed evenly through the frame. Extra support can be given at points where extra weight is placed, such as where the engine cars are fixed. This system of wiring is considered one of the most brillian and progressive features of the design of R.101.

The Engines

There will be five engine cars, two attached to frame 4, two to frame 9, and one centrally to frame 11. Each car is attached at two points only, and can be readily detached entire, even at the mooring tower, when an engine has to be changed. Each car contains one Beardmore 650-h.p. heavy-oil water-cooled engine. Each engine drives a pusher metal airscrew with two blades of variable and reversable pitch. The engine cars are very well streamlined, and inside there is ample room for engineers to attend to the engines, even to the point of changing a cylinder head in the air. The Tornado engine has passed its Air Ministry type tests, but each engine is put through an acceptance test on a gantry, where it must run in each position it may have to assume when flying. I saw one of the engines in its car being run at the gantry, with an auxiliary engine and airscrew running



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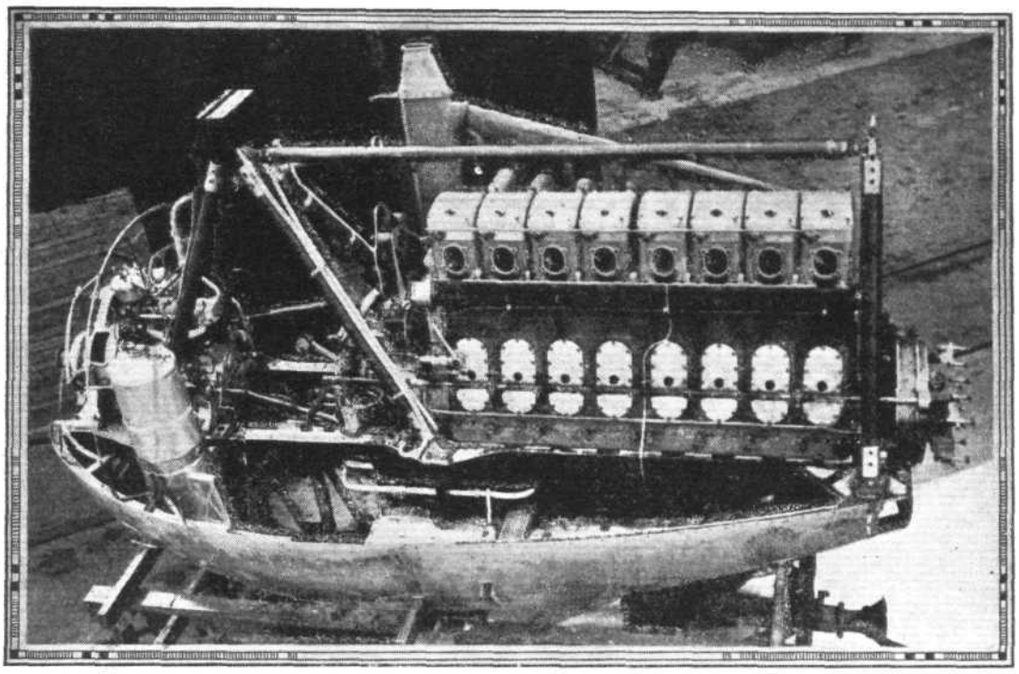
R.101 : This will be the Passengers' Saloon, the plywood floor of which (shown partly laid) extends across the bottom of the hull.



One of R.101's Power Units: One of the five Beardmore 650 h.p. heavy oil engines, which will use Diesel oil fuel instead of petrol.

[*Air Ministry Photograph.*]

in front to cool it. In each engine car there is a small auxiliary engine to start the main engine through a Bendix gear. In two of the cars, this small engine drives an air compressor to work the blowing of fuel from part to part of the ship. In the other three cars there is an electric generator, which can be driven by the auxiliary engine when the ship is not under way. When the ship is moving at over 40 m.p.h. the generators are driven by variable-pitch windmills.

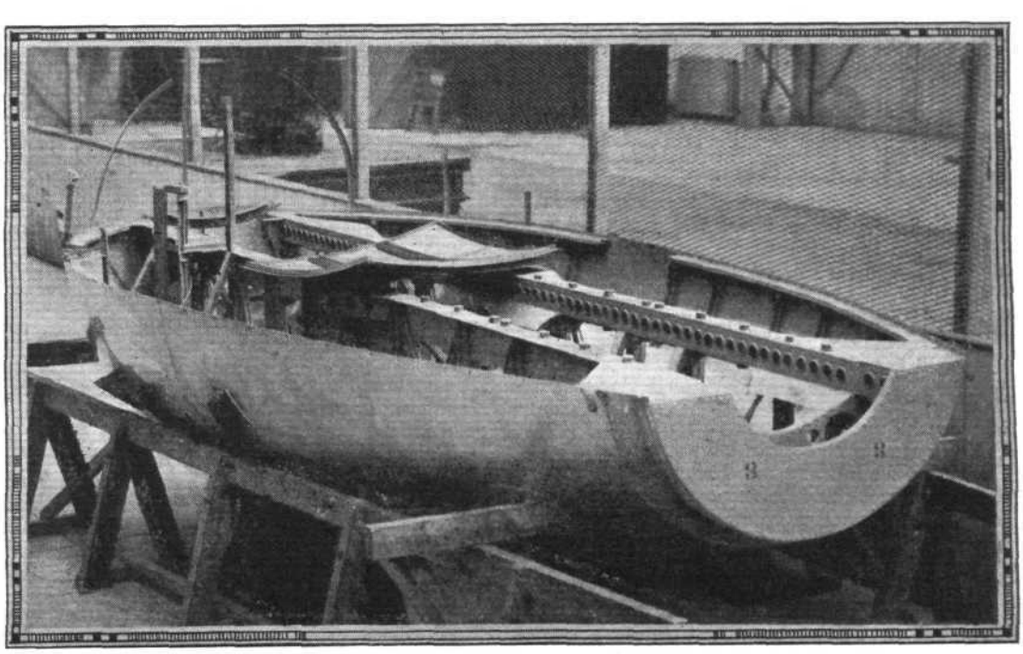
Though the engines are of the water-cooled type, instead of passing water through the radiator, steam only passes to a condensing radiator. The steam can also be used for heating the living quarters. Under normal conditions the engines will be cooled without any addition to the resistance of the ship.

The Living Quarters

The control car projects below the hull in bay 6–7. Immediately above it in bays 6–7 and 7–8 are the living quarters on two decks. Thus, only about one-seventh of the length of the ship is occupied with living quarters; but Col. Richmond remarked that he foresaw in future larger ships that the whole length of the ship would be occupied in this way. The lower deck has an area of 1,730 sq. ft. At the top of the companion down to the control car is the captain's "bridge," and adjoining that are the chart room and the wireless room. The kitchen, with its electric cookers, the passengers' smoking room, lavatories, and the quarters for the crew are all on this deck. The crew will consist of a captain, three officers, and 42 ratings, apart from stewards. There is one complete crew ready at Cardington now, largely composed of old airship hands, some of whom are employed in the interim as riggers and fitters. Others will be trained as soon as we have an airship in the air.

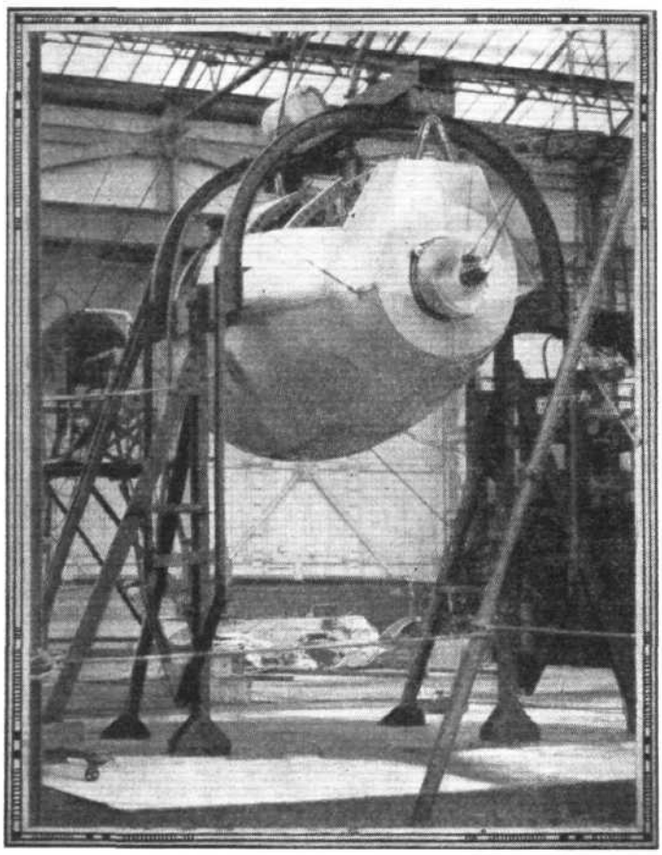
The upper deck has an area of 5,550 sq. ft., in addition to a promenade on each side. The aft part of the deck makes a lounge, washing accommodation is in the central portion, while the forward part is divided between cabins and a dining room to seat 50. The space is ample, and the 100 passengers should never feel cramped for room. The lighting arrangements also appear good, and in daylight there should not be need for more than a very little electric light. Outside the promenades there will be a row of glass windows inserted in the cover, and above them a larger area of celluloid windows. The lounge is largely open to port and starboard, so that light from the windows will come in. The furnishing and upholstering is to aim at being pleasing without extravagance. For the trial trips, it is not proposed to instal the full 100 berths.

As I stated before, the flooring of the upper deck is only



R.101: The lower half of one of the "Power Eggs," showing the engine bearers.

["FLIGHT" *Photograph*



["FLIGHT" *Photograph*

R.101 : A "Power Egg," complete with Beardmore heavy oil engine, undergoing a test. The Siddeley "Puma" engine in the background is supplying the artificial draught, to provide actual flying conditions.

now being put into place. As one stood on it and gazed up to the dizzy heights where the top girder work seemed to mingle with the rafters of the shed, with the fascinating mecchano all round one, and the one silver gasbag standing solidly to one's rear, it was not exactly easy to picture what the interior of R.101 will be when it is finished. But the model helped, and there was no doubt of the amplitude of the space. I only hope I may have the pleasure some day of standing on that same spot and smoking a cheroot, as I gaze on Karachi harbour down below.

["FLIGHT" *Photograph*

SAFETY FIRST : During our visit to Cardington a little demonstration, shown above, was given showing how the heavy oil fuel to be used by R.101 not only would not burn but easily extinguished a petrol fire.

Australia

LORD STONEHAVEN, Governor-General of Australia, who has been making a tour of Central Australia and part of West Australia, completed 2,000 miles of it by air. This showed him how important aviation might become in the remote parts of Australia.

The Short "Calcutta"

SIR ERIC GEDDES and the directors of Imperial Airways, Ltd., arranged to make a trial flight on August 29 in a Short "Calcutta" flying-boat, taking off from Southampton and flying to the Channel Islands and back. Imperial Airways have been approached by the organisers of the Liverpool Civic Week (September 22-29) with a view to a demonstration air service across the Irish Sea, between Liverpool and Belfast, during that week. It is proposed to employ one of the Short "Calcutta" machines.

Cape Town-England Flight

FLYING OFFICER P. MURDOCH left Johannesburg on August 28 for Cape Town to start on his return flight to England in the Avro "Avian" (Cirrus). He hopes to set up a record. On the outward flight, which started from England on July 29, he covered the distance of about 7,000 miles in 15 days. His machine has been overhauled.

The Avro "Avian" in Africa

OUR readers will, no doubt, remember that some little while back the Shell Co. of South Africa presented an Avro "Avian" to the Aero Club of South Africa. This machine is now being used by the Cape Town Flying Club, and Col. Beatty (chairman of that Club) writes to A. V. Roe and Co., Ltd., as follows :—"The Avian has just returned from its first long flight in this country, the writer and Mr. Penny having been to East London to the Aero Club meeting. The outward journey was purposely arranged to occupy two days, and took nine hours' flying time owing to a head wind at the start. The return journey was done in one day, 7¾ hours' flying time. It was agreed that the machine was the best looked after of those attending the meeting, while its red and gold completely captured the fancy of the ladies of East London, who queued up for passenger flights in it." Incidentally, the Cape Town Flying Club have placed an order for another Avian, which is to be shipped to them right away.

Swedish Flying Club Movement

THE Aerotransport Company, in order to stimulate the public interest in aviation, organised a propaganda flight around Sweden with a plane of the Junker F13 type, and another Swedish flyer did a similar tour in a de Havilland "Moth," covering a distance of about 4,375 miles in 60 hours' actual flying time without a mechanic. The average fuel consumption was about 4·375 gallons of petrol per hour. That flight amply demonstrated the safety and dependability of flying, as every take-off and landing during the long trip was made according to schedule and exactly on time, and it also showed the usefulness of the light aeroplane as a means of communication. The newly-formed Swedish Aviation Society has opened the first civilian flying school in Sweden. In less than seven weeks the school turned out 22 full-fledged pilots, and during that short period its school machines of the D.H. "Moth" type made 4,000 flights without one mishap or damage to one plane. The "aerodrome" has so far been made on the ice near Stockholm and now the bay has thawed seaplanes will be employed. The school will then be moved to Gothenburg and Malmoe, where summer courses will be held.

New Aerial Map of Great Britain

THE Air League of the British Empire has done a service to civil aviation by publishing a map of Great Britain indicating all the officially recognised aerodromes, seaplane stations, Customs stations, aerial lighthouses, prohibited areas and danger areas. The cheapest edition is 10*s.* 6*d.* Another edition costs 15*s.* 6*d.*, being mounted to roll, with black rollers and leads for hanging. A third edition costs 21*s.*, is mounted on cloth to fold in sections and fits in the standard map case. It is for the use of pilots.

Gipsy-Moth Owners

AMONG other private owners who have placed orders for Gipsy-Moths is the Hon. Geoffrey Cunliffe. Capt. Halse proposes to fly to Africa when he receives his machine.

FLIGHT
THE AIRCRAFT ENGINEER & AIRSHIPS

THE A.D.C. "CIRRUS" MARK III ENGINE

Rated at 85 B.H.P. at 1900 R.P.M.

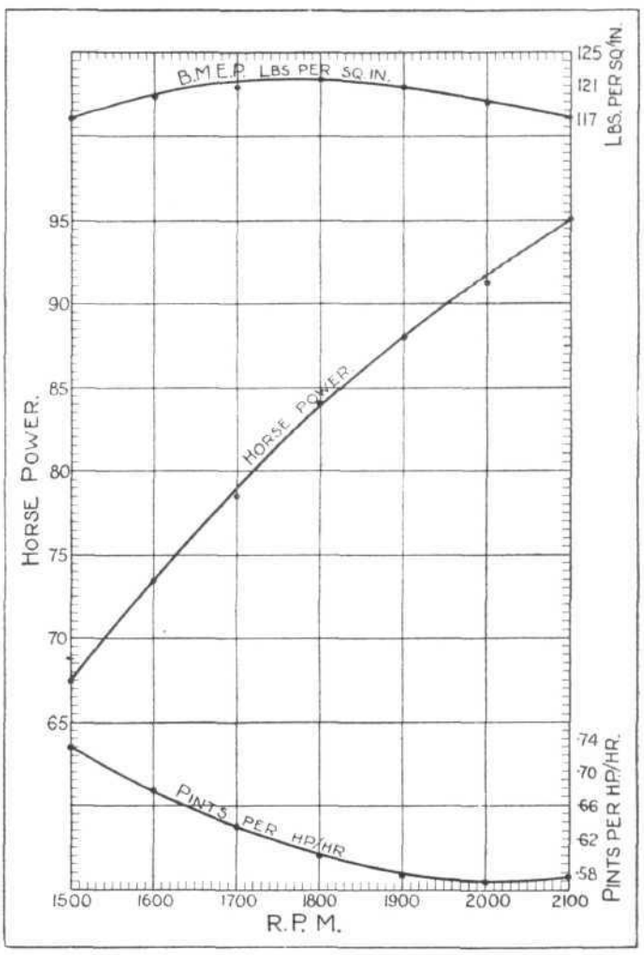
So excellent is the reputation for reliability which the "Cirrus" Marks I and II have established that one is justified in expecting that the latest of the series, the Mark III, recently produced, and which like the earlier models passed the Air Ministry type tests at the first attempt, will worthily uphold that reputation.

The "Cirrus" Mark III has been produced not to take the place of the "Cirrus" Mark II, but as an alternative engine for use in cases where slightly greater power is desirable, such as, for instance, for seaplane work, for flying in hot climates, or from aerodromes situated at a considerable altitude above sea level, when the performances as regards take-off and climb is to be retained.

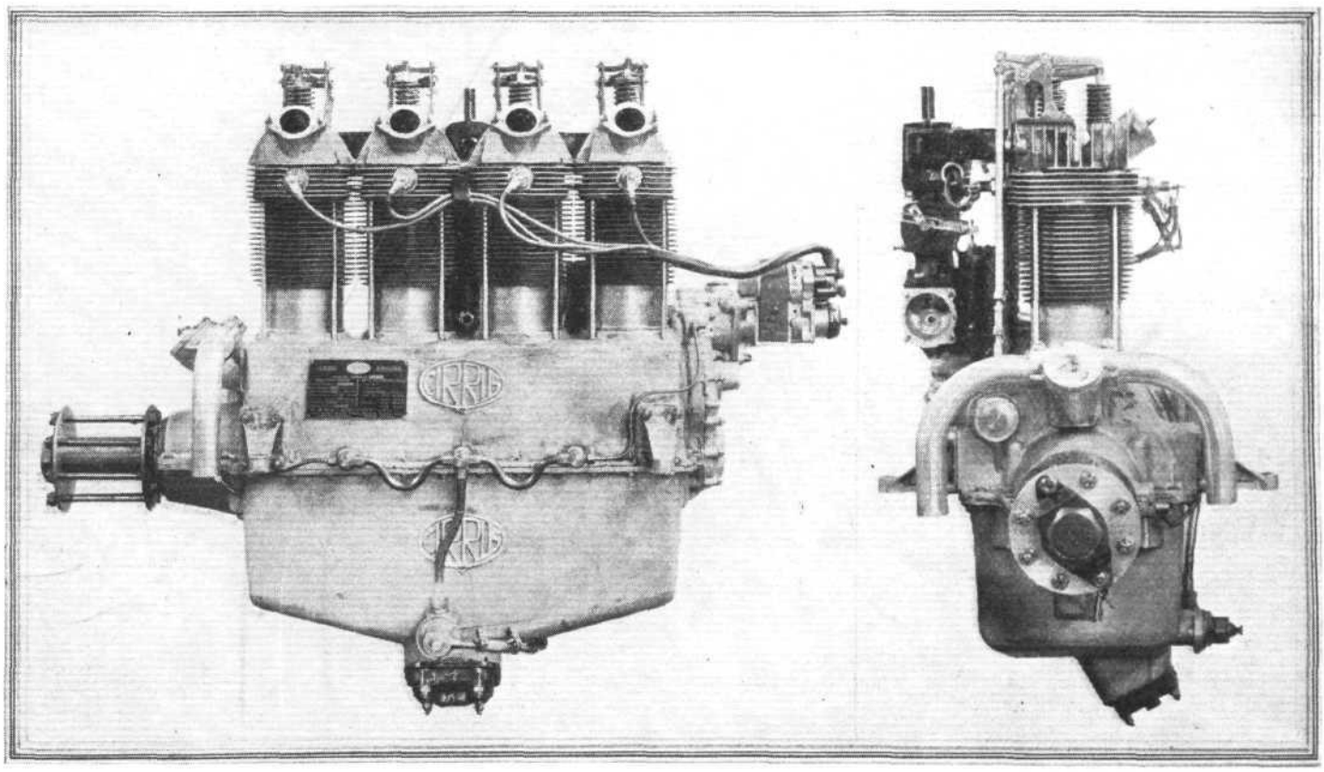
The "Cirrus" Mark III, it may be recollected, made its first appearance in public in the King's Cup Race this year, when two engines were entered in standard "Moth" and "Avian" light 'planes. The course for this race was one of 1,096 miles around Britain, and both "Cirrus" III engines completed the course flying at full throttle all the way. On its second public appearance the "Cirrus" III won first prize and a challenge cup at the Halton Air Pageant, so that it will be seen that the engine has started its career very well. Incidentally, it may be mentioned that A.D.C. Aircraft, Ltd., are in a position to commence deliveries of the Mark III "Cirrus" at once.

Lest it should be thought that the "Cirrus" III is an entirely new engine, we would point out that this is not so, and that in point of fact those wishing to do so can have their Mark II engines converted, the main changes being different cylinder heads giving better cooling, larger valves, and a higher compression ratio. The Mark III engine, although developing greater power, is of the same weight as the Mark II, and the price is the same. Thus prospective customers are able to choose whichever model is likely to suit them best, knowing that the question of price does not arise, while the fact that the two models are of the same weight means that either can be installed in a machine, without necessitating any changes to bring the trim of the machine right.

The two views of the engine show the clean appearance with very low frontal area, and in the side view the new cylinder heads and valve gear are clearly visible. The power and consumption curves give the majority of the information required by aircraft designers, so that it should be unnecessary



The "Cirrus" Mark III Engine: Power, consumption and M.E.P. curves.



THE NEW "CIRRUS" MARK III ENGINE: Exhaust side and front views. Note the new type of cylinder heads, etc.

to go into a detailed description here, the Mark II "Cirrus" being already well known to our readers, and the Mark III differing, as we have already said, in relatively minor respects only. The following specification may, however, be of interest.

Specification

Bore	110 mm.
Stroke	130 mm.
Total swept volume	4,939 c.c.
Normal brake horse-power	85
Maximum brake horse-power	95
Normal engine speed	1,900 r.p.m.
Maximum engine speed	2,100 r.p.m.
Direction of rotation propeller drive	Right-hand tractor direct.
Ignition	Dual ; two B.T.H. magnetos, type G.A.4
Tachometer drive	Half engine speed.
Petrol consumption	0·6 pint/h.p./hour.
Oil consumption	0·018 pint/h.p./hour.
Compression ratio	5·4 : 1
Weight of engine, dry	280 lb. (127 kg.).
Specific weight (on normal power)	3·3 lb./h.p. (1–5 kg./h.p.)
Length overall	1,161·5 mm.
Height overall	916 mm.
Width overall	482 mm.
Bearer centres	540 mm.

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CATTEWATER AIR STATION

Brief History

THE Air Ministry has decided to reopen the Cattewater Air Station, Plymouth, and station there the new fleet of all-metal Supermarine-Napier flying boats now being constructed. It has been closed since the war and cared for by an R.A.F. maintenance party. As a seaplane base it was officially commandeered in December, 1916, but actually taken over the following February, 1917. The next month, Flt.-Lt. J. F. A. Cripps took command. The greatest development took place in 1918, mainly under the command of Lt.-Col. F. K. Haskins, D.F.C., now Wing Commander.

Until about a year ago he was Superintendent of the R.A.F. Reserve. He went to Cattewater from another and smaller seaplane base at Newlyn, Penzance, and within a very short time considerably more flying was done and the long Cattewater breakwater projecting from the rocky headland was always lined with Short seaplanes, preparing for patrol or just returned from the Channel. One went shivering to the breakwater for the early morning patrol long before dawn had definitely arrived, or wrote out the report of the last patrol often past midnight.

The energetic lead of Flt.-Commander Hobbs made things always buzz. He was the brother of the Hobbs who won so many honours on the more dangerous Felixstowe patrol. He gave pilots a lot of embarrassment when they reluctantly taxi-ied back to the breakwater after vainly trying to lift a seaplane off a placid sea and increased it by jumping into the machine and simply shooting it off after a short run.

Later in 1918 a flying-boat squadron was added and operated from slipways built in the Cattewater itself (seen on the right of the photograph accompanying this article). The patrolling area of the station covered the coastline from beyond Torquay down to Land's End, across the Channel to the Channel Isles, and all the intervening Channel roughly parallel to the S.W. coast.

Some of the flying boats often patrolled over the French side. Wireless communication with Staddon Heights station, above the mouth of the harbour, was maintained during patrol by both Short seaplanes and the flying boats (if the wireless worked).

Quite a good percentage of the old Cattewater pilots are still in the Service or Civil Aviation to-day. Flt.-Commander H. G. R. Malet, who flew boats at Cattewater is Squadron Leader to-day at the Gosport Base. Since the war he has done a lot of work on the Fleet reconnaissance machines. Flt.-Lt. Campbell is at the Air Ministry, and also in the R.A.F. Reserve. Flt.-Lt. Graham, a Canadian, won the A.F.C. when at Cattewater. He bombed a submarine, and was noted for consistent patrol work. After the war he returned to Canada, and, one believes, flew with the Laurentine Air Service until a year or more ago.

Two of the most experienced and skilful pilots with Imperial Airways to-day, Capt. Horsey and Capt. D. Drew, were Cattewater pilots. Horsey was the "star turn" on Short seaplanes, and brought an interesting diversion to the monotony of Channel patrol, searching for something that was never there. Drew also was very clever on Shorts, and was the pilot who once landed a flying-boat in a ploughed field without damaging it. He flew the late Capt. Loewenstein on his tours in Europe and America.

General view of the Cattewater Air Station, Plymouth, which is to be reopened by the Air Ministry, with the town of Plymouth in the background, a corner of Plymouth Harbour on the left and the Cattewater itself on the right.

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

August 30, 1928

CONTENTS

EDITORIAL VIEWS

It is always refreshing to have an opportunity of examining how others do a thing which one has been in the habit of doing oneself in a certain way. One may often find the other fellow's way of doing it surprising; one may not know his exact reasons for doing it in a way so different, and thus one may very easily jump to hasty and erroneous conclusions. In his article on "Metal Construction at the Paris Aero Show" Mr. Pollard appears to have approached his subject with an open mind, ready to give credit where credit is due, and criticising what he considers less good.

It may, perhaps, be recollected that after the Paris Aero Show of 1926 Mr. J. D. North contributed to THE AIRCRAFT ENGINEER (December 30, 1926) an article on the Show, and it is interesting to find that on many points his impressions were a good deal similar to those recorded by Mr. Pollard in the present issue. Like Mr. Pollard, Mr. North was impressed by the high quality of the Duralumin stampings and forgings produced by certain French firms.

Mr. Pollard's remarks on the metal covered wing are interesting. He arrives at the conclusion that, contrary to the general belief, such wings are neither more complicated nor more costly than fabric covered wings. He does not attempt to give any opinion as to the relative weights of the two types, probably because item weight figures for the metal covered wings were not available. It would, however, be interesting to hear what he thinks, and perhaps we may persuade him to refer to that subject in a subsequent article.

Mr. Pollard rather takes to task some of the French designers for using Duralumin for wiring plates. "Whatever may be argued for and against Duralumin spars, ribs, etc.," he says, "there can be no two opinions as to which is the better material for wiring plates."

We believe that Mr. Pollard will be able to find, even in England, designers who are ready to join issues with him on that subject. For some considerable time now Vickers Limited have been building all-metal, and more specifically all-Duralumin, aeroplanes. In many of these they make use of Duralumin circular-section tube longerons, and the fuselage struts are attached to the longerons by plates wrapped partly around the longerons, the plates being used both for securing the strut ends and for taking the bracing wires or rods. Perhaps Mr. Pierson will contribute something on this subject?

METAL CONSTRUCTION DEVELOPMENT.

(At the Paris Show.)

By H. J. POLLARD, Wh.Ex., A.F.R.Ae.S.

This article makes a break in the series in order that metal construction development on the Continent may be described whilst the more prominent features of the various exhibits in the Salon de l'Aviation are still fresh in mind.

Needless to say, the French and German exhibits were constructed almost entirely of aluminium alloy or wood and, apart from the English exhibit, the only exposed steel structure was the Fokker fuselage.

The majority of readers will know why duralumin is the chief metal used in Continental practice. The main reason is, of course, that in Germany, and particularly in France, aluminium can be obtained cheaply in any desired quantity, while in France, at any rate, steel strip of the kind we are accustomed to in this country cannot be obtained except by importation at high prices. It is a fact, I believe, that until recently even steel tubes for the Fokker machines were obtained from this country. Some readers may think that both steel and aluminium alloys have been tried on the Continent and the steel found inferior for purposes of construction; this is not so. There are individuals who assume that what is adopted as standard abroad is certain to be the best, and that English constructors who use steel are merely wasting their time and resources. The fallacy of this assumption will be proved as time goes on.

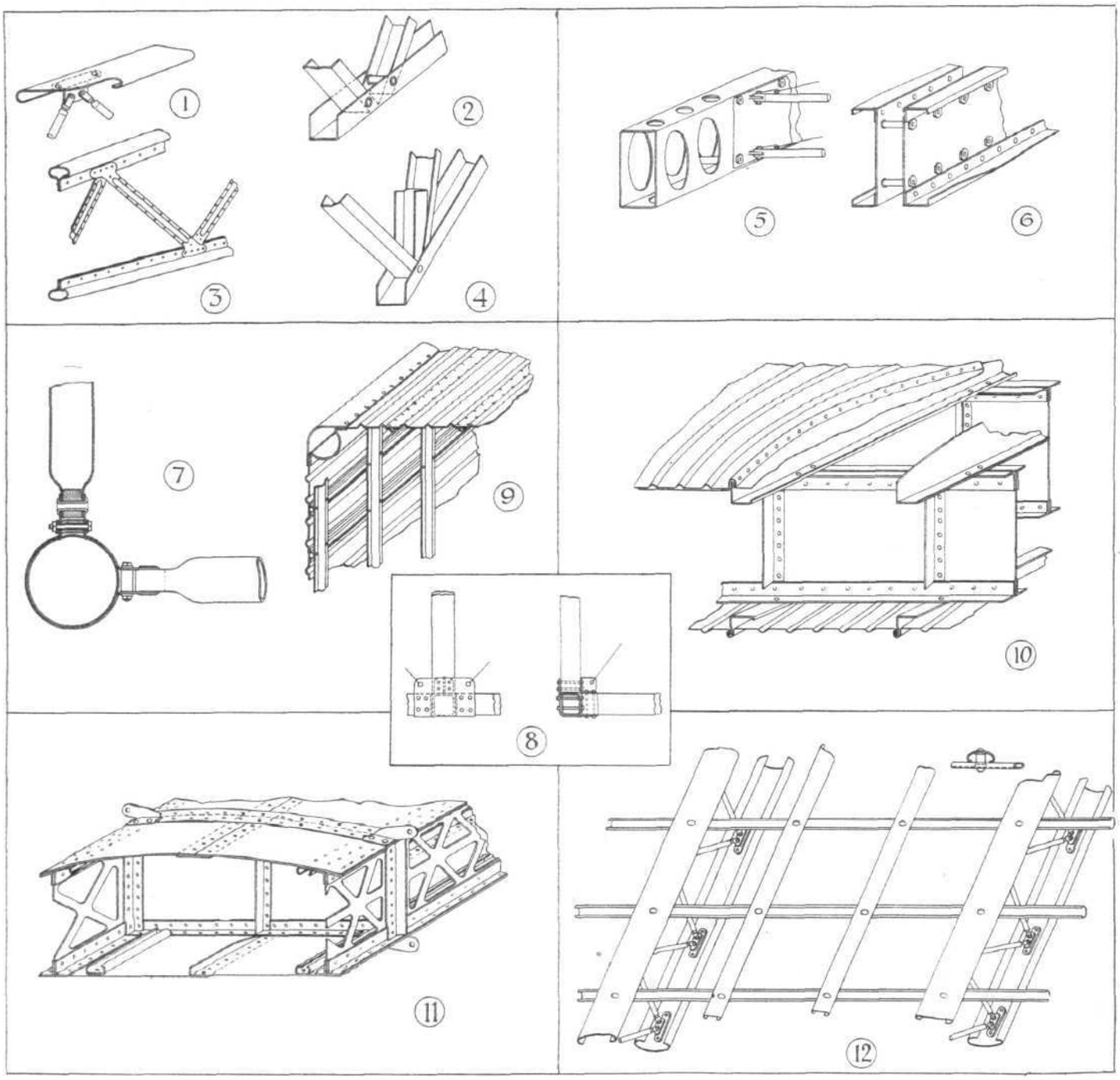
These notes are so far as possible set out in such a way that the reader may draw his own conclusions as to the relative merits of the various forms of metal construction exhibited. This can best be done by grouping and describing similar components from certain of the machines, excluding, however, the "Bristol" exhibit, particulars of which have already appeared in these pages.

Wing ribs make a convenient starting point: Taking then the ribs used on the Nieuport, Lioré et Oliver, Bréguet and Caudron machines respectively, sketches showing the main constructional features of these are shown in Figs. 1, 2, 3 and 4. The Caudron ribs were very similar in appearance to the Lioré et Oliver type, while the Bréguet and the Nieuport ribs, particularly the latter, appeared to be stronger than the others, they also looked as if they would fare much better than the Caudron and Lioré et Oliver types on vibration tests, but they gave the impression of being rather expensive to make.

From Fig. 1 it will be seen that the Nieuport rib has wide channel booms, and that the sides of the channel are curved well inwards. Bracing anchorages are riveted at intervals

to the base of this channel. The bracings consist of duralumin tubes having internally attached fork ends. One can only guess at the way these ends are secured, but it would appear to be by pressing the material of the tube into a groove in the socket.

The Bréguet ribs are better known. Each boom consists of a single duralumin strip formed into a circle, the edges of each strip being riveted together along their lengths, the ends of the bracings are inserted at intervals between the edges of the boom and secured thereto by rivets. The bracings consist of two similar dished pressings riveted together round the edges. A modified form of Bréguet rib has been adopted in one instance in this country. The Caudron and Lioré types are more familiar and consist in each case of simple channel booms and bracings, the latter which fit inside the former are held thereto by distance pieces and rivets, the rivets passing through the sides of the channels of the booms and bracing. In Caudron ribs, pairs of bracings, all of which are separate pieces, meet at common points on the booms and are secured thereto by a series of common rivets; sometimes four members are held by one rivet and in other cases three members or less, while in the Lioré ribs, each bracing had its own pair of rivets, one for each end. It might be thought that the securing of a number of bracings, together with a single distance piece by one rivet, would be a more economical matter than having separate rivets for each bracing, but, judging from the speed at which Lioré ribs were being produced quickly by a few women workers actually operating in the gallery of the Exhibition, it is doubtful whether modification of the bracing arrangement could result in quicker production. This rib production was instructive. The booms were, apparently, sent to the Exhibition already formed, this being probably for convenience in the matter of heat treatment. A special feature of these booms is that one length of channel only is used for both upper and lower members. This necessitates a bend of 180° "against" the sides of the channel; to effect this in 26 G (?) duralumin without buckling the flanges is something of an achievement in the manipulation of metal through the "plastic" state. The length of the sides of the channel are about 0·5 in. and the radius of bending is less than 0·5 in.



The booms are put into a steel jig and the bracings are fitted; these have previously been bevelled off in appropriate jigs by means of an ordinary circular saw. Care is taken that the ends of the bracings fit up against the base of the channel booms, the jig is then slid along on rails to the next operator who fits a cover to it and drills all the holes through hard bushes in the cover. A flexible drive from an overhead motor is used for this purpose. The jig then slides along for-

the next operation: the insertion of distance pieces and rivets, The rib is then taken from the jig and the rivets clinched under a power press, the empty jig being sent along on the return track for a repetition of the operations. Metal construction of ribs by such methods is thus shown to be a very inexpensive matter. I am doubtful, however, as to how long these and the Caudron ribs would remain intact under a vibration test similar to that officially used in this country; at the same time I do not suggest that these ribs give trouble under service conditions. On this point I have unfortunately no information.

For small components, fins, rudders, etc., ribs pressed from sheet were seen, this is good practice for small ribs. In America, and on some German machines, this practice is extended to large ribs, but such a practice cannot on large members result in economy in either cost or weight. The Hanriot products had timber ribs, on metal spars, a practice adopted in the early stages of metal wing development in this country; although abandoned, this system even now has its advocates here.

Turning now to wing spars, the majority of French uncovered exhibits had spars of rectangular tubular section, these were in some cases lightened in both flanges and webs by plain (unflanged) circular holes (Fig. 5). The fact that this construction should be entertained after English practice is well known, as it must be, is really amazing. "The proof of the pudding is still in the eating," but one could not help wondering what intensity of stress would be developed round the edges of some of these holes in the narrow sides of the rectangles, particularly if the real position of points of contra-flexure and maximum stress did not coincide with those calculated. The holes were not continuous nor evenly spaced along the whole length of the spar, but occurred only at places presumably of minimum stress. The spars in the Fiat machine shown at the last Exhibition had holes in the sides, they were made from two pieces of approximately channel shape, the lap joints being carried along the upper and lower sides or flanges of the spars, thus giving these portions where maximum stress occurs some reinforcement by reason of the double thickness. If these solid drawn rectangular spars with unsupported lightening holes are light and have adequate strength, then all that is required is done. One set of wings having such spars was exhibited, stood on end on the Lioré et Oliver stand and stretched from the floor almost to the roof of the Grand Palais. The lower portion had what appeared to be an internal reinforcement of timber, whether this is used on the actual aircraft to give additional strength to the lightened webs of the spars, or whether it was merely for handling purposes or to enable the wings to be stood on end. one cannot say.

The Caudron spars were of a novel form. An idea of the construction may be gained from Fig. 6. Each spar consists of two channel-like members, made up of a flat-plate web (unlightened) to the longitudinal edges of which are bolted channels, having one side shorter than the other. The channels are decreased in width outwards along the span, thus becoming angles with a continuously decreasing horizontal side. Whether this refinement is worth making is questionable, the weight saving can be but small. Finally, these main built-up channels are secured together along their upper and lower edges by a large number of closely-spaced bolts and distance pieces. A third design, more in keeping with English standards, is the Nieuport spar, as used on the Nieuport-Delage. This is simply a box spar made from four pieces in the usual manner with four outwardly projecting flanges, the flat plate flange being laminated to give some uniformity of stress. In similar duralumin spars made in this country, the flange is usually corrugated, although, perhaps, to the extent of only of one lobe. This permits of some reduction in thickness of metal, and in no way interferes with lamination.

Another spar shown was that usually used on Bréguet products, a solid-drawn hollow girder section, lightness and taper at the tip being obtained by inserting two channels secured back to back, these being held in place so far as one could judge by set screws filed off flush with the external surface of the girder section. Another form of Bréguet spar used is that of the single-centre web with lobed flanges formed from strip secured to the upper and lower edges of the web, a form of spar quite well known in this country.

The Dyle et Bacalan Company had no machine on view, but showed several examples of construction, including a built-up box spar, this again being liberally lightened in the webs.

Other points in spar construction may arise when we consider complete assembled units.

Fuselages were in the main wire-braced. One noticeable example of a fabric-covered fuselage without wires was seen on the Caudron stand; in fact apart from control cables and external wing bracing, there was not a wire on this machine.

In the "strut and wire" constructions a good deal of sectioned tubing was seen. The most-favoured method was to use square or circular longerons and square or circular tubes for bracing flattened at the ends as far as the ductility of the metal permits; a typical joint is shown in Fig. 7, which is a sketch of a fuselage joint taken from the Caudron machine, the bulkhead member being omitted for the sake of clearness. A variation of this is shown in Fig. 8, while the front end of the fuselage on the Ateliers des Mureaux Stand had round tubes for bracings; this follows a well-known English practice. The fuselage on the Lioré stand had square longerons with strut and wire bracing, the struts being fitted into end sockets which were held to the longerons by bolts passing through these members, the plan and side view members being slightly offset to allow of this. We may say then that, apart from the Caudron fuselage, in which even the bulkhead members were tubes, there is no substantial departure from English practice, except in the material used. Strut and wire duralumin fuselages are not unknown in this country. Attention must be drawn to one important detail, that is the use on French machines of duralumin wiring plates. Whatever may be argued for and against duralumin spars, ribs, etc., there can be no two opinions as to which is the better material for wiring plates.

It only remains to describe a few special types of fuselage construction, but before doing so we will mention a matter which has recently been under discussion: we refer to the alleged dangers of the "rigid" welded fuselage as typified in the construction of the forward end of the Fokker machine. It has been said that, probably due to unequal cooling after welding, such fuselages may fall apart under their own internal stresses and that some wire bracing is essential for safety in this construction. Large numbers of Fokker machines have been used for a long time without recorded mishap due to failure of these parts: it is difficult in the light of this experience to see why the construction is considered to be very unsafe, but caution and experience must be exercised in the building. A part of the care necessary probably consists in the assembly of the struts in proper sequence.

A metal monocoque fuselage of pleasing appearance, although perhaps of no better appearance than the Short fuselages, is that of the Nieuport-Delage. I think the internal structure of the Nieuport is different from that in the English products, the hoops being of half-round section with outwardly extending edges, these edges are bolted to the base of flanged channels, and the outwardly extending edges of these channels are riveted to the skin of the fuselage at the lap joints. The body appears to have a double curvature and would therefore be a more expensive proposition than the large flat-sided fuselage exhibited on the other side of the Nieuport stand. Fig. 9 shows a section of a corner of this fuselage.

The Wibault fuselage, although metal covered, is built on quite different lines, and is simply an N-braced girder with metal covering. The longerons and struts are simple angles and are secured together by means of gusset plates. The corrugated duralumin sheets forming the skin are placed with the corrugations vertical so that there are in consequence a number of vertical rows of rivets; internally at these lap joints, light stiffening angles are used and where they cross the main girder members their inwardly projecting sides are cut away. The skin gives the impression of fragility, one could only hazard a guess at the thickness, which appeared to be

about 0·015 in. It must however play an important part in giving rigidity and strength to the structure, for one cannot imagine such light angles as these substituted for the built-up members of the fuselage of the "Bristol" exhibit without incurring considerable loss in strength. The main difference between the "Bristol" and Wibault constructions arises from the assumption that the fairing and covering of the "Bristol" machine takes no load, while the covering on the Wibault machine must be assumed to stabilize the primary members. One cannot conceive that simple duralumin sections used in the elementary manner seen here could, unsupported, sustain anything but very low stresses without failure.

The metal-covered Wibault wings are, if anything, even simpler in construction than the fuselage, the method of securing spars, ribs and covering is shown in Fig. 10. A spar consists simply of a flat web, angles being secured to the edges of the web. The ribs consist of angles, having one edge riveted to the spar flanges, the upper edge being shaped to the contour of the aerofoil. The covering is secured in the manner shown in the sketch.

Many people believe that metal covered surfaces involve greater complication and increase in manufacturing costs, but judging from the Wibault wing and a small metal wing of Rohrbach design also on view, the reverse would appear to be the case.

As most readers will know, the forward and aft portions of the Rohrbach wing are detachable, only the centre portion supplying the moment of resistance. This centre portion has much in common with the Wibault wing. The two spars are similar except that in the Rohrbach design the web is liberally lightened along its length (see Fig. 11): the triangular holes probably assist in assembly. Where the covering plates abut, a bulkhead consisting of the usual fore and aft lightened flat plate having four angles attached is inserted internally, this is riveted to the skin. Longitudinal corrugation is dispensed with, but stout channels having inwardly-turned lips are secured to the skin just aft of the front spar and just forward of the rear spar. The spar webs are also reinforced at intervals with vertical or diagonal stiffeners and the skin has also "occasional" stiffeners. Apart from the longitudinal channels additional stiffness against bending is obtained by turning up the edge of one of the cover plates. A line of joining lies midway between and parallel to the spars. This is a lap joint and the under plate is simply left long, then turned up at right angles and flattened again where the transverse bulkheads cross. It would be impossible to have anything simpler than this.

We pass quickly over the Junkers exhibit, its corrugated wings, body empennage, etc., being familiar to most readers. A full description of its design and manufacture is given in the *Aeronautical Journal* for September, 1923.

Returning to fabric covered wings, etc., ease of assembly seemed in general to be the keynote. In wings having rectangular spars, the ribs are fitted with plates having similar rectangular holes. After the ribs are slipped into position endwise movement is prevented by numerous light-gauge wires running the length of the wing. The ribs on the Nieuport are connected to the box spars by suitable angles riveted to brackets secured to the spar webs. A similar method, except that angle brackets are secured to the spar flanges, is adopted for the Caudron double-channelled spars. No further comment on these fixings is necessary beyond this, that the inter-connection of open-type girder members by means of suitably bent plate fittings is always a simple matter; the only thing to watch is that the riveting points are easily accessible.

Reference has already been made to the apparently rather expensive Nieuport ribs. The economy of construction of the Nieuport wing, however, allows of the incurring of extra expense in rib making. The ribs are spaced about three times as far apart as in other wings of about the same size; for the prevention of fabric sag and other possible troubles a network of curved channelling is used. These subsidiary members spread from wing tip to outer tank ribs, the latter having flat plate webs and ordinary rib flanges with the web heavily reinforced, and from the inner tank ribs to the wing root, also from leading edge to trailing edge. Fig. 12 shows a small portion of the construction, the "stringers" on the underside being omitted. Where these subsidiary members cross each other or cross the main ribs distance pieces are introduced, the connection being made by rivets. This arrangement gave the impression of lightness, the large loads carried by the main ribs make them really economical on a weight-strength basis.

The large Y struts used on this machine, joining the undercarriage to the top wing, incidentally passing through and supporting the subsidiary bottom wing, are pressed parts. These members are of the order of 10 ft. or 12 ft. long and only production on a large scale could warrant the necessary tool making for such a job.

The writer does not know how many of these machines have been ordered or are on order by the French Government, but large numbers of what appeared to be similar aeroplanes were seen flying at the Vincennes Pageant.

Constructions involving a single large built-up duralumin interplane strut are favoured by French designers, but usually the centre portion is made from two parallel parts riveted together. The ends are separately pressed parts, as exemplified on the Bleriot and Breguet machines. While these strut end pressings must be of fairly involved shape in order to connect the two spars in the upper and lower wings with the one central strut, they are of great simplicity compared with the pressed fitting used on the Dewoitine undercarriage. The production of large duralumin pressings and forgings has evidentally received great attention in France, and the aircraft constructors are fortunate in having this highly-specialised trade at their command. An examination of the stands of the Fonderies Montupet and the Forges de Foulain gave much information as to the variety of castings, forgings and pressings which these firms offer to the French aircraft industry.

On the Amiot S.E.C.M. products, a very large number of pressings are used. I believe I am correct in saying that this firm were originally press tool makers, and turned to aviation as a side line; if this is so, it explains why these complicated pressings are used.

The Italian and Czecko-Slovakian exhibits were, as regards main members, entirely of timber.

Generally, throughout the exhibits, hollow rivets were extensively used, also solid rivets seemed largely to have taken the place of eyelets. Most of the simple fittings on the square longerons were riveted in place; bolting would appear to be a simpler method of fixing, nevertheless bolts were used very extensively in certain cases, instances being the attachment of fittings to rectangular spars in wings. It was further noted that where rectangular solid-drawn spars were used, double internal wing bracing was always employed, see Fig. 5, spaced as widely apart as the depth of the spars permitted.

Workmanship, generally, was of a very high order, particularly tinsmiths' work. Some beautiful cowling and fairing was shown, but it was not always obvious how these parts could be quickly detached.

In English construction, great rigidity of the tail portion of an aeroplane is required, for example, if, when a machine stands on the ground it is possible to get any degree of angular movement by pushing up and down on the tail plane tip, the whole structure at once falls under suspicion, no matter how steady the tail is in flight. From the knife-edge shape of some of the fuselage tails exhibited, it appeared that this rigidity would be lacking in many of the exhibits. Also the complete absence of protecting coating from the duralumin structures was very noticeable. It is not a very expensive matter making an aeroplane reasonably corrosion proof, and if any length of life of the structure is required, such protection is of course imperative.

A Correction

Lines 14 and 15 of right hand column on p. 54 of July 19 issue should read: . . . . Fig. 8A, 8B, and 8C, part A $r_2 \alpha_1 = r_2 \alpha_2 = r_3 \alpha$, etc.

FACTORS IN SEAPLANE FLOAT DESIGN

By WM. MUNRO

(*Concluded from page* 59.)

Getting Off Speed for Floats of Similar Form

From the stipulations made in Froude's Law of Comparison, we can estimate what the taking-off speed of the new machine should be. Remembering that "the speeds of the vessels must be proportional to the square root of their linear dimensions," we have—

$$\frac{V}{v} = \sqrt{\frac{L}{l}}$$

And as "the ratio of the linear dimensions will be the cube root of the ratio of displacements," we have—

$$\frac{L}{l} = \sqrt[3]{\frac{W}{w}}$$

$$\therefore \quad \sqrt{\frac{L}{l}} = \frac{W^{1/6}}{w}$$

so that, given the weights W and w of the two machines and the taking-off speed S of the machine used as a base, then the taking-off speed of the new machine should be $= S \times \frac{W^{1/6}}{w}$

Problems of Resistance.

Subdividing the total water-resistance in the accepted manner, we have :—

(1) Frictional or skin resistance.
(2) Eddy-making resistance.
(3) Wave resistance.

As might be expected, frictional resistance is at low speeds a high percentage of the total resistance.

The resistance due to eddy-formation is small in a clean design with fine lines aft, but a marked increase will occur if a projection of any kind is fitted to the tail of the float. Against the aerodynamic advantage of fine lines aft, must be placed the necessity for maintaining enough buoyancy aft to give suitable righting moments.*

It is, however, with wave-making resistance that the real problem arises, and in particular with the occurrence of wave-interference.

The phenomenon of wave-interference—that is to say, the interference of succeeding crests and troughs of the bow transverse system with the stern wave—is of a very complex nature.

There are two separate and distinct series of waves caused by the motion of a vessel through the water :—

(1) At the bow.
(2) At the stern.

Each of these series of waves consists of (1) a series of diverging waves, the crests of which slope aft ; and (2) a series of transverse waves, whose crests are nearly perpendicular to the middle line of the ship.

"The transverse waves show themselves along the sides of the vessel by crests and troughs. The lengths of these waves (*i.e.*, the distance from one crest to another) bears a definite relation to the speed of the vessel."

Experiments made by Froude show that residuary resistance varied in a vessel which always had the same fore and after bodies, but had varying lengths of parallel middle body inserted, thus varying the total length.

"These variations in residuary resistance for varying lengths are attributed to the interference of the bow and stern transverse series of waves.

"When the crests of the bow-wave series coincide with the crests of the stern-wave series, the residuary resistance is at a maximum.

"When the crests of the bow-wave series coincide with the troughs of the stern-wave series, the residuary resistance is at a *minimum*."

As previously mentioned, the interference between port and starboard float wave-systems adds further complications.

As the speed of the vessel increases, the bow and stern wave systems are affected *differently*, and the *positions* of the wave crests relative to the vessel defy accurate computation by any means other than tank-tests.

It is in consideration of the bow-wave system likely to be formed that the angle of entrance compels attention. An angle of 34° has proved satisfactory in practice. (See Fig. 2.)

Another problem for investigation may be mentioned, which, (while not of such practical importance as the co-relation of float length, wave-length, and speed involved in the study of wave-interference) is yet by no means lacking in interest. This is *the effect of depth of water on speed.*

It may seem early in the day to compare our present sea-planes and flying-boats to ships of the line, but in view of the development of these craft the following excerpt from "Manual of Seamanship" may be of interest.

"In Destroyers and Torpedo Boats it has been found that considerable differences in speed can be obtained for the same power in different depths of water. The German Scout *Bremen*, of 3,000 tons with 11,000 i.h.p., obtained 22½ knots in 14 fathoms, whilst in 35½ fathoms of water she obtained the same speed with 9,750 i.h.p. In torpedo craft, differences of speed of as much as 5 knots have been noted.

"The difference is caused by the formation of a solitary wave of translation which moves forward with the ship. A certain depth of water is more favourable to the formation of this wave, and in such a depth a larger resistance is experienced."

One notes that a new tank for the testing of seaplane models is provided for in the Air Estimates, and looks forward with interest to the advance in knowledge of wave-interference and kindred problems which is bound to accrue.

The remaining problem of interest in the design of seaplane floats is the aerodynamic one of step resistance, and the considerations involved may best be indicated by the following notes supplied by Mr. G. H. Dowty, A.F.R.Ae.S., who has been interested in this problem for some time.

The value of any such scheme, would, of course, depend on the simplicity and efficiency of the designed components, which, in practice, might be difficult to attain.

"The steps used on flying-boats and seaplane floats, while essential to the ease and speed of 'unsticking' from the water, are a great handicap in flight, and at least one-fifth, if not more, of the total aerodynamic resistance of floats can be directly attributed to the step.

"Particularly in the case where high speeds are attained, the presence of even a small step incurs a large loss of power.

"Taking for an example an actual case of a fast seaplane having a step of total back area of 0·65 square feet, the step, at a velocity of 220 m.p.h. will absorb 54 h.p."

The proposal favoured by Mr. Dowty as a means to reducing the step drag was

Collapse of the Step at High Speeds

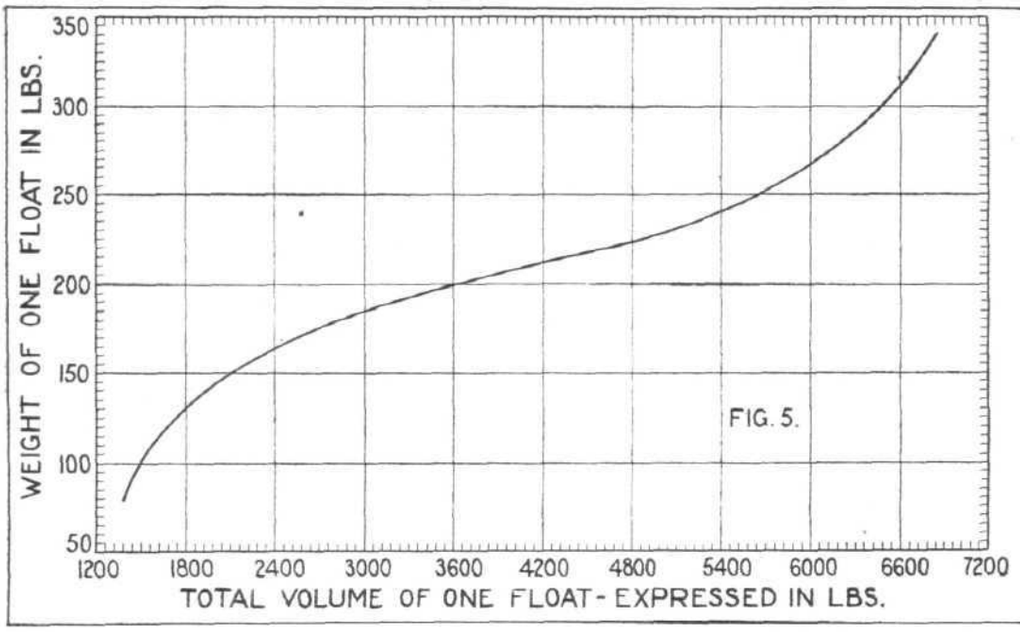
"The float is built up without the step, this being added afterwards as a separate unit.

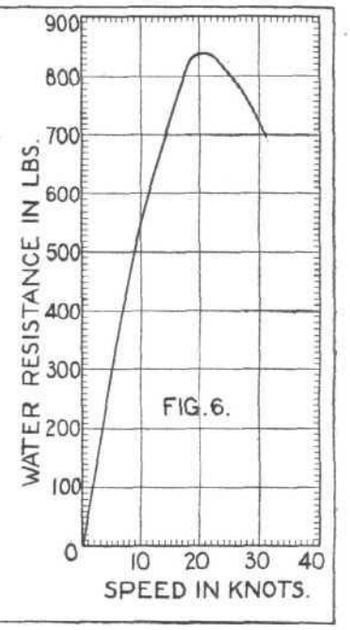
"The step is made in two portions, one either side of the keel. The front ends of the step are made fast to the float and the rear ends are held away from the float at the required distance by suitable supports. These supports, when collapse is required, can be released to allow the step to lie up flush with the sides of the float."

To obviate further controls in the cockpit, an automatic means of operation was suggested, this being carried out by a control device on the lines of the Savage-Bramson anti-stall gear, whereby operations might be carried out at a predetermined flying speed, or alternatively "by a control operated by pressure derived from a breather on the float top and working in the slip-stream : at high velocities the pressure produced to be applied through a diaphragm, plunger or similar means to operate a quick release."

While on the subject of "step," it is of interest to note that the *aft* step of the new flying-boat *Calcutta* appears, in published photographs, to be "faired-in," and to speculate whether or not this has a definite bearing on the latest ideas for the design of flying-boat planing-bottom : That is to say, relying on one step only at take-off.

* See "Seaplane Stability Calculations," AIRCRAFT ENGINEER, Feb. 23rd and March 29th, 1928.





A perusal of recent technical publications also indicates that a considerable amount of experimental work has been done in America, in "springing" the floats from the step for alighting on ice.

It is more than probable that the desire to produce floats economically will tend to the simplification of accepted present-day design of lines. One means of doing so is to maintain a constant radius for the deck aft of the step, the skin above chine being wall-sided. This eliminates a considerable amount of panel-beating.

In the event of such a system becoming generally recognised the coefficient values given in this article would, of course, have to be revised as data accumulated to conform with the new "lines." The method of drafting out the approximate shape could then be applied in similar fashion to that described.

It seems unlikely that the present-day shape for planing-bottom will be drastically modified. It is at least safe to assert that any appreciable advance in hydrodynamic performance can only be looked for as the result of thorough and exhaustive tank-tests.

Several firms interested in seaplane development abroad have already installed test-tanks for this purpose.

Although to some extent the lines design and structural requirements are co-ordinated, the constructional features and methods of assembly have not been discussed at length here, as they do not strictly come within the scope of this particular article.

On Fig. 5 the weights of floats for some twenty seaplanes are plotted against total buoyancy, giving a useful approximation to the weight which may be expected in dural float construction.

Fig. 6 shows the total water resistance of a comparatively clean float on a base of speed, for a seaplane of 4,000 lb. all-up weight.

TECHNICAL LITERATURE.

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS.

These Reports are published by His Majesty's Stationery Office, London, and may be purchased directly from H.M. Stationery Office at the following addresses: Adastral House, Kingsway, W.C. 2; 28, Abingdon Street, London, S.W.1; York Street, Manchester; 1, St. Andrew's Crescent, Cardiff; or 120, George Street, Edinburgh; or through any bookseller.

CHARTS FOR THE CALCULATION OF AIRSCREW THRUST AND TORQUE COEFFICIENTS. By J. D. Coales. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1114 (Ae. 287). (7 pages and 12 diagrams.) September, 1927. Price 6*d.* net.

About eight years ago, charts were produced for the purpose of simplifying the calculations of the thrust and torque coefficients of airscrews. At that time, the theory of airscrews was not so well established as it is now, and the charts were not published because of the discrepancies that were found to occur between the calculated and full-scale values of torque coefficients. The charts are based on the same equations that occur in the modern Vortex Theory of airscrews, as given in "Aerofoils and Airscrew Theory," by H. Glauert, and are equally valid whether the Vortex theory or the older inflow theory is followed.

Besides generally reducing the amount of computation in the complete estimation of an airscrew performance, the curves enable the thrust and torque coefficient of an airscrew at a particular value of V/nD, to be obtained with a minimum of trouble.

A SURVEY OF LONGITUDINAL STABILITY BELOW THE STALL, WITH AN ABSTRACT FOR DESIGNERS' USE.—By S. B. Gates, M.A. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1118 (Ae. 291). (27 pages and 22 diagrams.) July, 1927. Price 1*s.* 3*d.* net.

A new system of units, in which the resistance derivatives are expressed as non-dimensional quantities has been suggested by Mr. Glauert in report R. & M. 1093.* This allows a much more compact analysis of longitudinal stability below stalling than has hitherto been given. In this work, the theory has been thrown into such a form as may bring it within the scope of designers.

A description of longitudinal stability is attempted in terms of the two quantities practically at the disposal of designers:—Position of centre of gravity and size of tail. With these co-ordinates, and certain other parameters, the region of longitudinal stability is defined on a series of plane diagrams; and in typical cases the plane has been covered by curves from which the damping and period of the phugoid motion may be estimated.

An abstract of instructions for using the diagrams is added.

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* R. & M. 1093. A non-dimensional form of the stability equations of an aeroplane.—R. Glauert.

MODEL EXPERIMENTS WITH REAR SLOTS AND FLAPS ON AEROFOILS R.A.F. 31 and R.A.F. 26. By H. B. Irving, B.Sc., A. S. Batson, B.Sc., and A. L. Maidens. R. & M. No. 1119 (Ae. 292). (8 pages and 8 diagrams.) November, 1927. Price 6*d.* net.

This is a continuation of general research on the slotting of aerofoils.

Aerofoils of sections R.A.F. 31 (with front slot) and R.A.F. 26 (without front slot) were fitted with rear slots formed by the gap between flap and main portion and the best position of flap when at 20° to main wing found. In the case of R.A.F. 31 experiments were limited to one shape of slot, while on R.A.F. 26, three variations were tried.

The rear slot on R.A.F. 31 gave a maximum lift coefficient with flap at 20° and front slot open of nearly 1·2, being over double that of the original aerofoil. The rear slot itself gave an increase in lift coefficient of 0·15 with front slot open and flap at 20°. With flap at 0° and front slot closed the rear slot increased the minimum drag by about 10 per cent., but there was no appreciable alteration in maximum lift/drag ratio. Maximum lift with flap at 20° and front slot open occurred at 18·3°, compared with 23·8° incidence on the aerofoil with front slot, but without flap, and 12·3° on the original unslotted aerofoil.

On aerofoil R.A.F. 26, the highest lift coefficient obtained was 0·753 or 55 per cent. more than on the original aerofoil (0·485). The increase in minimum drag was only about 2 per cent.

In all cases, maximum lift is much more sensitive to changes in flap position which alter the width of slot than to changes in a direction parallel to the

slot. Choice of hinge position so as to bring the flap to the best position when set down is important.

Distribution of pressure over the leading auxiliary aerofoil on R.A.F. 31 is to be measured particularly in connection with the development of the automatic front slot.

AN ANALYSIS OF SOME CAUSES OF DISCREPANCY BETWEEN THE CALCULATED FAILING LOAD OF THE STRUCTURE OF AN AIRCRAFT AND THE LOAD AT WHICH FAILURE OCCURS ON STRENGTH TEST.—By H. B. Howard, B.A., B.Sc., and K. T. Spencer, B.Sc., A.M.I.C.E. of the Airworthiness Department, Royal Aircraft Establishment. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1125. (Ae. 298). (9 pages and 5 diagrams). August, 1927. Price 6*d*. net.

It is well known that the load at which an aircraft structure fails is seldom exactly the same as the maximum load which calculations show the structure to be capable of carrying. The present Report deals with some of the more usual causes of this discrepancy, and records some values for the ratio between the calculated and test failing loads for some typical structures and components.

Records of mechanical tests on complete structures, components and materials have been analysed and compared with calculations on the structure and the strength values for the material assumed in calculations.

No reliable conversion factors for relating the strength as calculated with that obtained on test can be established without considerably more test data than are at present available.

Records of strength test as they become available will be examined and compared with calculations on the structure tested. In this way it is hoped to collect sufficient information to justify a statistical treatment of the subject.

MOTORING LOSSES IN INTERNAL COMBUSTION ENGINES.—By H. Moss, D.Sc., A.R.C.S., D.I.C., of the Air Ministry Laboratory. Communicated by the Director of Scientific Research. R. & M. No. 1128 (E. 27). (7 pages and 2 diagrams.) July, 1927. Price 6*d*. net.

Experiments which have been made on internal-combustion engines at the Air Ministry Laboratory and elsewhere (see *The Automobile Engineer*, March, 1925),* have led to the conclusion that the frictional losses when running under power may be considerably different from the losses when the engine is motored round at the same speed and wall temperature: the deduction of the indicated horse-power from the brake horse-power and the motoring losses is consequently in error. In the case of an aero-engine of normal design, a large increase of sliding friction has been found. Part of the increase can be attributed to carbonisation of the oil and part to increase of the normal forces at the rubbing surfaces. An investigation into the magnitude of the latter effect has been made.

The total frictional losses of a Benz single-cylinder engine were found when motored at speeds of 1,200 r.p.m. and 900 r.p.m. with air at densities ranging from normal to twice normal. The pumping losses, measured by an R.A.E. electrical indicator, were deducted, the remainder being the sliding friction of engine and accessories.

The sliding friction under power may be greater than that when motoring by the equivalent of 3·5 lb. per sq. in. M.E.P. due to this cause. With an increase of 3·5 lb./sq. in. in M.E.P. found by Ricardo due to carbonisation, the magnitude of the effect when running under power with a normal spark setting is fully explained.

* See also Ricardo "Internal-Combustion Engines," II, 217.

A HIGH SPEED WIND CHANNEL FOR TESTS ON AEROFOILS.—By T. E. STANTON. R. & M. No. 1130 (Ae. 300). (9 pages and 6 diagrams.) January, 1928. Price 9*d*. net.

A number of experiments have been made on high tip speed airscrews at the Royal Aircraft Establishment, and it was desired to obtain, if possible, a check on the performance of the blade sections at the high wind speeds at which they work. The Airscrew Panel of the Aeronautical Research Committee accordingly requested that some tests might be made of small aerofoil sections in an existing high-speed wind tunnel at the National Physical Laboratory.

The National Physical Laboratory 3-in. high-speed wind channel has been modified for the purpose of the tests, and an aerodynamic balance constructed for tests on aerofoils. Tests under conditions of infinite aspect ratio and at speeds ranging from 0·25 to 1·7 times the velocity of sound have been made on scale models of R.A.F. 31a and a circular arc section, whose maximum ordinates were respectively 7 per cent. and 3 per cent. of the chord (Fig. 4). Two models of each section were tested—R.A.F 31a with chords of 0·5 and 0·25 in. circular arc with chords of 0·5 and 0·3 in. The same sections have been tested in airscrews at the Royal Aircraft Establishment.*

The increase in the slope of the lift curve without appreciable change in the angle of no lift as the speed increases up to 0·6 of the velocity of sound, predicted in R. & M. 1135,¶ has been verified. The limiting speed at which this effect ceases appears to be considerably higher for the circular arc aerofoil than for R.A.F. 31a, but in both cases, when the limit is reached, the lift falls rapidly for higher speeds, and the angle of no lift tends to zero value. At speeds considerably above the velocity of sound (1·7a), the angle of no lift has a negative value for R.A.F. 31a and a positive value for the circular arc aerofoil.

* R. & M. 1086. Wind tunnel tests with high speed airscrews. The characteristics of the aerofoil section R.A.F. 31a at high speeds.—G. P. Douglas and W. G. A. Perring.

† Wind tunnel tests with high tip speed airscrews.—G. P. Douglas and W. G. A. Perring. R. & M. 1091.

‡ R. & M. 1123. Wind tunnel tests with high tip speed airscrews.—The characteristics of bi-convex No. 2 aerofoil section at high speeds.—G. P. Douglas and W. G. A. Perring.

¶ R. & M. 1135. The effect of compressibility on the lift of an aerofoil.—H. Glauert.

FULL-SCALE AND MODEL MEASUREMENTS OF THE LIFT AND DRAG OF THE BRISTOL FIGHTER WITH M.2 SECTION WINGS.—By E. T. JONES, M.Eng., and A. S. HARTSHORN B.Sc. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1133 (Ae. 303). (8 pages and 8 diagrams.) November, 1927. Price 6*d*. net.

Full-scale and model measurements of the lift and drag of the Bristol Fighter with M.2 section wings have been made to provide data on the scale effect of the thin symmetrical wing. The lift and drag of the Bristol Fighter, fitted with wings of R.A.F. 15, R.A.F. 19 and R.A.F. 30 section have been measured both full-scale and in the National Advisory Committee for Aeronautics variable density wind tunnel.* The full-scale measurements with M.2 section wings extend the comparison between the results obtained in the variable density tunnel and free flight tests.

The lift and drag coefficients have been determined full-scale over as wide a range of incidence as possible (2° to 20°). Wind tunnel experiments on a 1/10th scale model have been made over a slightly larger incidence range at wind speeds of 40, 60 and 80 ft./sec.

The maximum lift coefficients for full-scale and model are 0·432 and 0·38 respectively. The minimum drag coefficient decreases as the Reynolds number increases, being 0·0315 at 40 ft./sec. on the model and 0·028 full scale. The results are in quite good agreement with those of the N.A.C.A. variable-density tunnel.†

* R. & M. 1122. Lift and drag of three model aeroplanes. Comparative tests in atmospheric and variable density wind tunnels at the same Reynolds number.—H. C. H. Townend. (N. A. C. A. Report No. 279).

† N.A.C.A. Report No. 221. Model tests with a systematic series of 27 wing sections at full Reynolds number.—Max M. Munk and Elton W. Miller.

THE THEORY OF PRESSURE CAPSULES. PART I.—GENERAL DISCUSSION. PART II.—THE COMPLETE FLAT DISC WITHOUT CONTROL SPRING.—By A. A. GRIFFITH, D.Eng. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1136 (Ae. 306). (14 pages and 1 diagram.) August, 1927. Price 9*d*. net.

Hitherto no adequate theory of the action of pressure capsules has been available. It has, therefore, not been possible either to predict the performance of capsules or to correlate the performance with the known mechanical properties of the material. Consequently design and development have in the past been almost entirely empirical In the present series of reports, the general principles governing the action of pressure capsules will be discussed, and the detailed theory of such action will be given in a number of cases.

The finite deformation of any capsule necessarily involves the occurrence of extensional as well as inextensional strains. The principal condition for optimum performance is that the effects of the extensional strains shall be reduced to a minimum. Two general methods of attaining this end are described in the present report.

References are made in the report to the work of J. H. Jellett (Dublin Trans. R. Irish Acad., Vol. 22 (1855)) and Prescott (The Equations of Equilibrium of an Elastic Plate under Normal Pressure, Phil. Mag., Jan., 1922, p. 97).

NOTES ON PERFORMANCE TESTING.—By H. L. STEVENS, B.A., and A. E. WOODWARD NUTT, B.A., of The Aeroplane and Armament Experimental Establishment, Martlesham Heath. Communicated by the Director of Scientific Research, Air Ministry. R. & M. No. 1140 (Ae. 309). (8 pages and 6 diagrams.) February, 1928. Price 6*d*. net.

In June, 1925, a report *was presented to the Aeronautical Research Committee by Mr. Capon describing a method of performance testing which has since come to be known as the "Research Method," and which was recommended for adoption by Martlesham Heath on selected aircraft. The object of the present note is to put on record the method of performance testing at present in force at Martlesham partly as a result of this recommendation.

The present method is a combination of this research method with the straightforward method of direct measurements of climbs and speeds. It is considered that the above method of performance testing provides both the data required by the Service and that required for analysis by the designer and research worker with the minimum of flying time. The analysis allows the consistency of the figures to be checked and separates engine effects from aerodynamic effects. The effect of changes of weight can be readily calculated taking into account the variation with height of the power of the actual engine employed. The effect of throttling the engine to predetermined r.p.m. can be quickly found. Finally, the total flying time is very little in excess of that required for the straight tests, bearing in mind the number of repeat tests necessary, and the gain in accuracy is very great.

* R. & M. 985. "The Reduction of Aircraft Performance Tests." By R. S. Capon, B.A.

WIND TUNNEL TESTS ON A R.A.F. 15 AEROFOIL WITH PILOT PLANES.—By F. B. BRADFIELD, Math. and Nat. Sci. Triposes and K. W. CLARK, B.Sc., D.I.C. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1145 (Ae. 313). (17 pages and 15 diagrams.) October, 1927. Price 1*s*. net.

A "pilot plane" is an auxiliary aerofoil pivoted ahead of a wing so as to provide automatically a slotted wing at high incidence without much increase of drag at fine angles. This forms part of an investigation into the use of pilot planes with wings of various sections.

The maximum lift region was investigated with pilot planes of chord 7½ per cent., 10 per cent., and 12½ per cent. of the main chord, trying different hinge positions relative to the main wing in each case. The drag of the best lift arrangement for each pilot plane was measured, and the angle at which the pilot plane floated freely was recorded. In the case of the 10 per cent. pilot plane, the drag and free settings were repeated with the pilot plane hinged ahead of its leading edge; and hinge moments were measured with the hinge both at, and ahead of, the leading edge. The tests were extended to cover the use of the pilot plane as a control, and rolling and yawing moments have been measured with the pilot planes in front of the ailerons only, using Frise balanced ailerons.

With a 10 per cent. pilot plane, the maximum lift coefficient of a R.A.F. 15 aerofoil may be increased to 0·80, and the increase of drag at top speed is less than the minimum drag of the pilot plane when tested alone; but the increase of drag is greater on the climb. By making the stop which limits the pilot plane angle vary with the aileron angle, the pilot plane gives an efficient slot-and-aileron control, the pilot plane reversing the sign of the yawing moments at angles just over the stall. With fixed stop the aileron control is much improved by fitting pilot planes, but the effective control may still be poor owing to the pilot plane increasing the stablity.

FULL SCALE AND MODEL MEASUREMENTS OF LIFT AND DRAG OF A BRISTOL FIGHTER FITTED WITH R.A.F.34 WINGS.—By J. K. Hardy, B.A., and A. S. Hartshorn, B.Sc. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1146. (Ae. 314). (9 pages and 9 diagrams.) November 1927. Price 9*d*. net.

This report forms one of a series of comparisons between the full scale and model lift and drag of biplanes fitted with thick wings.

The lift and drag of a Bristol Fighter with wings of R.A.F.34 section have been determined for the full scale aeroplane and for a one-tenth scale model at speeds of 40, 60 and 80 ft./sec.

The maximum lift coefficient (0·53) is higher for the full-scale aeroplane than for the model (0·52) but the increase is not so great as for R.A.F.30* or R.A.F.31.† The minimum drag coefficients, both model and full scale, are the same as for R.A.F.31 which has the same centre line camber and thickness but is not reflexed.

* R. & M. 1052. Full scale and model measurements of lift and drag of Bristol Fighter with R.A.F.30 wings.—A. E. W. Nutt, R. G. Harris and L. E. Caygill, R.A.E.

† R. & M. 990. Full scale and model measurements of lift and drag of Bristol Fighter with R.A.F.31 wings.—B. D. Clark, R. G. Harris and L. E. Caygill, R.A.E.

WIND TUNNEL TESTS OF AEROFOIL R.A.F.36.—By F. B. Bradfield, Math. and Nat. Sci. Triposes, and K. W. Clark, B.Sc., D.I.C. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1147. (Ae. 315). (5 pages and 4 diagrams.) December, 1927. Price 6*d*. net.

R.A.F.36 is an aerofoil of the R.A.F.30 series, designed for use with a self-adjusting pilot plane and flap. The centre line equation is $y = 0{\cdot}0748 \times (1+x^4)$, which has 4 per cent. maximum ordinate.

Lift, drag, and centre of pressure were determined at $R = 0{\cdot}251 \times 10^6$ and $0{\cdot}336 \times 10^6$, and minimum drag was measured from $r = 0{\cdot}168 \times 10^6$ to $R = 1{\cdot}00 \times 10^6$.

The main characteristics at $R = 0{\cdot}251 \times 10^6$ are given, compared with other aerofoils of the series :—

Aerofoil	Camber	k_L max.	k_D min.	k_{M_0}	L/D max.
R.A.F.36	0·04	0·590	0·0080	−0·0325	20·7
R.A.F.30	0·00	0·415	0·0054	0·0000	18·2
R.A.F.31	0·02	0·526	0·0065	−0·029	19·1
R.A.F.32	0·05	0·656	0·0083	−0·067	18·1

k_D min. at $R = 1{\cdot}00 \times 10^6$ has dropped to 0·0061.

R.A.F.36 will be tested with a self-setting inter-connected pilot plane and flap, such that the pilot plane will pull down the flap and itself form a slot at low speed, and will reflex the flap at high speed.

VARIABLE DENSITY WIND TUNNEL. REPORT OF THE SCALE EFFECT PANEL.* R. & M. No. 1149. (Ae. 316). June, 1927. (4 pages and 1 diagram.) Price 4*d*. net.

The Scale Effect Panel were appointed to examine modern results on the scale effect of aerofoils and the advantages which might result from the use of a variable density wind tunnel.

At the request of the Aeronautical Research Committee and by the courtesy of the National Advisory Committee for Aeronautics, three typical models representing British full scale experiments were tested in the U.S.A. variable density wind tunnel. By using such a tunnel, results comparable with full scale flight experiments can be obtained on a tenth scale model at half-speed, the forces on the model being one-twentieth of those on the full scale. With any type of wind tunnel at atmospheric pressure the force on the model at full scale Reynolds' number is equal to that on the full scale aeroplane.

After examining the results obtained in the American tunnel, the Panel are satisfied that the variable density tunnel has justified its place in the essential apparatus of a first-class aerodynamic laboratory. The provision of such a tunnel would enable a large amount of experimental work to be done in the laboratory which otherwise could only be conducted much more slowly and at greater cost in free flight. The Panel are of opinion that the tunnel should not be regarded as a means of reducing the present full-scale facilities, but as a means of accelerating and extending aerodynamic research. So far as can be seen, full scale experiments must remain the ultimate standard of reference.

It is expected that the value of the variable density tunnel will be found chiefly in effecting a reduction of landing speeds, investigating control at low speeds, and improving performances by the reduction of drag.

The Panel strongly recommend the construction of a variable density wind tunnel in this country.

* Membership :—Prof. L. Bairstow, C.B.E., F.R.S. (Chairman), Prof. B. M. Jones, M.A., A.F.C., Mr. E. F. Relf, A.R.C.Sc., Mr. R. McKinnon Wood, M.B.E., B.A., A.M.I.C.E., F.R.Ae.S., and Mr. J. A. Doak (for Secretary, A.R.C.).

STRESSES IN A PLATE BOUNDED BY A HYPERBOLIC CYLINDER.—By A. A. Griffith, D.Eng. Presented by the Director of Scientific Research, Air Ministry. R. & M. No. 1152. (M. 55). (10 pages.) January, 1928. Price 9*d*. net.

In 1913*, Inglis obtained a general solution in elliptic co-ordinates of the problem of plane strain and was thereby able to solve a number of problems of stress distribution in a plate containing a small elliptic hole.

* Proc. Inst. Naval Architects, 1913.

Inglis' results have been widely used in investigations of the effect of cracks in isotropic solids and have been of great value in that connection. Their usefulness has, however, been limited by the restrictions that the crack must be small and must not be near any other traction-free boundary. For instance Inglis' results cannot be used in the important case where two cracks approach one another closely.

In connection with the theory of the mechanical properties of solids it is necessary to study also the case where the corners of the cracks are in close proximity.

The problem is attacked by the method of finding solutions for the case of a plate bounded by a hyperbolic cylinder, which in the limit gives a representation of a solid containing two long cracks which nearly meet, (1) for the case of a shearing load, and (2) for the case of a tensile load.

The theory indicates that in a solid containing cracks of the type described, certain elements can undergo elastic rotations of the order of 5° to 20°. In the case of crystals this influence suggests a possible experimental means of establishing the existence of such cracks or their equivalents.

ENGINEERING AERODYNAMICS*

The latest addition to the volumes of the Ronald Aeronautic Library by so well known an American authority as Walter Diehl is, as its title implies, of a practical nature, being intended for the use of the aircraft designer rather than the student of aerodynamics. It is for this reason that the conventional treatment of elementary aerodynamic considerations, such as airflow patterns and pressure distributions, is omitted, thus allowing more attention to be concentrated on the problems encountered in design. The author has made an effort to present all data in the form best adapted to convenient application to design problems.

Very sensibly the book begins with an explanation of the coefficients employed, the author pointing out that the early American work used the symbols K_x and K_z for lift and drag coefficients, going over, in 1919, to the "absolute" coefficients L_c and D_c (which were the same as the K_L and K_D coefficients used in Great Britain). More recently yet a third change has been made, by adopting the "absolute" coefficients employed by Prandtl. The new coefficients are designated C_L and C_D, and have twice the value of the corresponding British "absolute" coefficients. This is, of course, due to the use of $\frac{1}{2}e$ instead of e and is much more logical.

British readers of Walter Diehl's book who bear these differences in mind (conversion factors are given) will have no difficulty in using the various formulæ straight away, and "Engineering Aerodynamics" can be thoroughly recommended.

A list of the chapters and their headings will give a very good idea of the scope and nature of the book: I, Wing Section Data; II, Wing Theory; III, Airplane Model Tests; IV, Parasite Drag Data; V, Control Surface Design; VI, Engine and Propeller Considerations; VII, Performance Calculations; VIII, Variation of Rate of Climb with Altitude; IX, Aspect Ratio and Parasite Drag; X, Reduction of Observed Performances to Standard Conditions; XI, Notes on Flight Testing; XII, Range and Endurance; XIII, Special Flight Problems; XIV, Performance Estimation; XV, Seaplane Floats. The book concludes with three appendices on Standard Atmosphere, Conversion Factors and Useful Formulæ.

* "ENGINEERING AERODYNAMICS." By Walter S. Diehl, Lieut. (CC) U.S. Navy.—The Ronald Press Company, New York. $7·00.

DYKE'S AIRCRAFT ENGINE INSTRUCTOR*

Although it is an American publication, and deals chiefly with American aero engines, this book is well worth a study by anyone interested in the subject of aero engines. As far as British readers are concerned, the main interest of the book will lie in the very detailed descriptions and illustrations of such well-known American engines as the Wright "Whirlwind," the Pratt & Whitney "Wasp," the Curtiss D. 12, the Packard 2A—1500, 2A—2500 and 3A—2500, and the Fairchild-Caminez.

As the title implies, the book is intended as an instructor in the care and maintenance of these engines, and the chapters of it dealing with the engines mentioned above are somewhat similar to the instruction-books on British engines issued by the Air Ministry. The freehand sketches of details which are such a feature of British books are, however, absent in this publication.

The chapters of the book are headed "Instruction No. 1," "Instruction No. 2," and so forth. No. 1 deals with the elementary principles of internal-combustion engines, while "Instruction No. 2," the largest section in the book, is entirely devoted to the "Whirlwind." In addition to the chapters dealing in great detail with the engines mentioned, there is a section on aircraft engine lubrication; another giving brief specifications of miscellaneous engines such as the "Air Cat," the Bristol "Jupiter VI," some Anzani engines, some Junkers engines, and some Ryan-Siemens engines. Then follows a chapter on certain early engines, including the Curtiss OX-5, OXX-6, Hispano-Suiza engines, Gnome, Monosoupape, Liberty, etc. Rather a heterogeneous collection.

Follows a chapter on magnetos (Scintilla, Splitdorf), another on carburettors (Stromberg), and yet another on starters and generators. Finally, there is a section dealing with instruments and controls, as well as one on miscellaneous aircraft information. The book concludes with a reprint of the American N.A.C.A. Nomenclature for Aeronautics.

Although somewhat "cataloguey," Dyke's "Aircraft Engine Instructor" is well worth a study by anyone interested in American engines and engine equipment.

* Dyke's "Aircraft Engine Instructor," by A. L. Dyke. Published in Great Britain by S. G. Gillam, Bath Road, Cowes, Isle of Wight. Price 22*s*. 6*d*. net. Postage 9*d*. extra.

FLIGHT
AIRCRAFT ENGINEER AND AIRSHIPS

PRIVATE FLYING

A Section of FLIGHT in the Interests of the Private Owner, Owner-Pilot, and Club Member

AUTOGIRO LIGHT 'PLANE

PRIVATE owners and flying-club members are likely to be very interested in the latest type of light aeroplane which is now being constructed and should be ready in a few weeks' time. It will be none other than an Autogiro designated as "C.17." The Autogiro principle is being applied to a two-seater Avro "Avian" fuselage of the standard type except for the modifications necessary for adapting the rotor and widening the wheel track. This machine is being constructed at Messrs. A. V. Roe's works at Hamble, where so much of the Autogiro construction and experimenting has taken place during the last few years, during which Messrs. A. V. Roe and Co. have been of great assistance to the Cierva Autogiro Co., Ltd.

It will have the four blades, doubly articulated, and roller bearings to the main articulation. The central hub will run on ball bearings and the loads transmitted to the fuselage by the inclined mast and two struts forming a tripod. Construction is of H.T. steel tube and steel forgings. Each blade will be built up on a steel tube spar with spruce ribs and fabric-covered, and having a leading edge reinforced with three-ply top and bottom. There will be easily accessible adjustable weights provided at the blade-tips for balancing the rotor.

Auxiliary and control surfaces will embrace a monoplane stabiliser wing, semi-cantilever, with spruce spars and three-ply and fabric covering, at a dihedral angle of 5°. There will be normal unbalanced ailerons of the full span; fixed tail plane and elevators of the standard "Avian" type, but with the "Avian" fin and rudder modified in shape.

Equipment will be as usual in the "Avian" with the addition of the Vickers hand petrol pump for pumping the fuel from the main to the gravity tank, and a revolution indicator for the rotor.

An A.D.C. "Cirrus" Mark II engine will be the power unit, driving a tractor airscrew and giving a maximum horse-power of 80 at 2,000 r.p.m.

Weights and dimensions are approximately as follows :—

Overall diameter of rotor	33 ft. 3¼ ins.
,, length of aircraft	28 ft. 9 ins.
,, height of aircraft (tail down)	11 ft. 1 in.
,, ,, ,, (tail up)	10 ft.
Span of stabilising plane	19 ft. 9 ins.
Chord of stabilising plane at body	2 ft. 11½ ins.
,, (including ailerons tapered to) at tip	2 ft. 1 in.
Dihedral angle of stabilising plane	5°
Undercarriage, track	8 ft. 7½ ins.
Tare weight	970 lbs.
Crew	340 lbs.
Luggage and miscellaneous extra load	(not yet allowed for)
Fuel, 17 galls.	130 lbs.
Oil, 1½ galls.	15 ,,
	1,455 lbs.

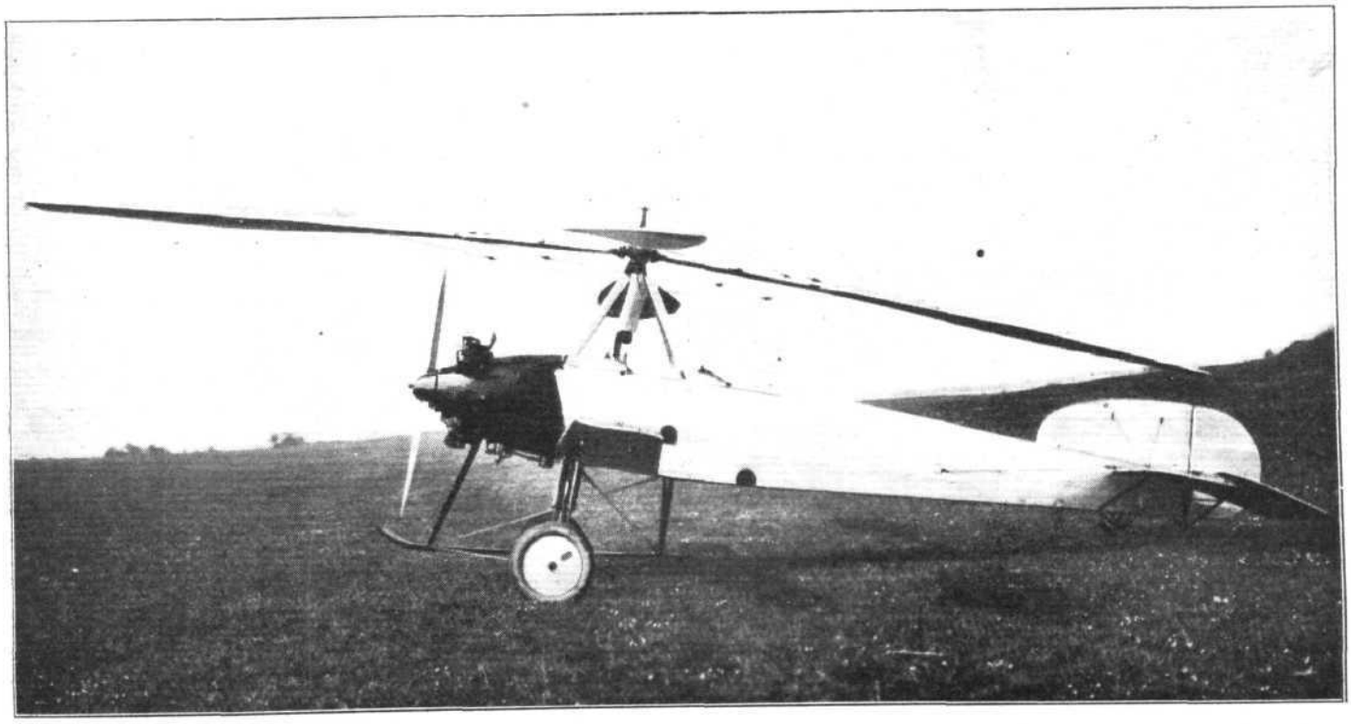
Estimated performance :—

Maximum speed (sea level)	90 m.p.h.
Minimum speed (sea level)	25 m.p.h.
Rate of climb (sea level)	500 ft. per minute.
Cruising speed (sea level)	70 m.p.h.
Duration of flight, cruising	three hours.
Normal rotor revolutions in flight	130 r.p.m.

This machine will enter the market at a competitive price.

TOUR ROUND THE FLYING CLUBS

A tour in this country has just been completed by the most powerful Autogiro yet built in order to demonstrate the principle to the flying clubs and the public generally. This machine, Autogiro "C.8.L.2" (Armstrong-Siddeley "Lynx 180 h.p."), was piloted by Flying Officer A. H. C. A. Rawson, test pilot to the Cierva Autogiro Co., and started



Cierva Autogiro "C.8.L.2" (Armstrong-Siddeley "Lynx" 180 h.p.), which recently toured Great Britain.

from Northolt on August 7 with a visit to Hadleigh, Suffolk, the home of the Suffolk Club. Next came Norwich, then Nottingham, where Sir Harold Bowden, President of the Nottingham Club, was one of the interested spectators. A return to Northolt was made in the evening. A few days later the Northern section of the tour was begun with visits to Sherburn, for the benefit of the Yorkshire Club, and later Howden, before Comdr. Burney, of the Airship Guarantee Co.

The failure of an undercarriage wire caused the arrival at Newcastle three hours later than anticipated, but the short demonstration in the evening was followed by another the next morning. Starting at noon, the Autogiro then flew non-stop to Edinburgh, and after a brief stay continued to Renfrew (Glasgow), reaching there in the evening.

The home of Air-Commodore J. G. Weir (Chairman of the Cierva Autogiro Co., Ltd.) at Dalrymple was visited and a demonstration given. Flying Officer Rawson went on to Turnhouse after the Scottish Club members had witnessed his display on August 19, and came south again via Newcastle, Brough, and Cranwell (where the pilot was an instructor while in the R.A.F.). He flew across country to Hooton Park for the benefit of the Liverpool Club, and finished the tour with visits to Birmingham and Bristol. Incidentally, a number of R.A.F. stations were included in the tour, which, with the exception of one or two minor troubles such as the breakage of the undercarriage wire and bending of the rudder, had been accomplished with ease. A Continental tour beginning with a cross-Channel flight, is now contemplated.

Nine Autogiros have been sold—four to the British Government, three to Spain, one to Italy, and one to America. Experiments are now in progress on a starting gear which will eliminate the taxying now necessary to get up the required Rotor revolutions. The C.8 L.2 is practically the standard type now, and embodies the rotor principle applied to a modified Avro-Lynx 504/N training machine. It has four blades, and the loads are transmitted to the structure by a cabane of four steel tubular struts. There is dual control and tail-trimming gear, and rotor lateral trimming gear in front cockpit.

Weights and dimensions, etc. :—

Diameter of rotor	39 ft. 8 ins.
Overall length	36 ft.
,, height (tail down)	14 ft. 9 ins.
,, ,, (tail up)	13 ft.
Span of stabilising plane	23 ft. 2 ins.
Ailerons, span	7 ft. 3 ins.
,, chord	1 ft. 6 ins.
Undercarriage, track	11 ft.
Wheels, Palmer	750 × 125 mm.
Tare weight	1,650 lbs.
Fuel capacity, 42 galls.	317 ,,
Oil capacity, 3½ galls.	35 ,,
Crew, two	320 ,,
Extra disposable load	148 ,,
	2,470 lbs.

Performance (guaranteed) :—

Maximum speed (sea level)	100 m.p.h.
Minimum speed (sea level)	25 m.p.h.
Rate of climb (sea level)	500 ft. per min.
Cruising speed (sea level)	85 m.p.h.
Duration of flight, cruising	three hours.
Normal rotor revolutions in flight	115 r.p.m.

LIGHT 'PLANE CLUBS

London Aeroplane Club, Stag Lane, Edgware. Sec., H. E. Perrin, 3, Clifford Street, London, W.1.

Bristol and Wessex Aeroplane Club, Filton, Gloucester, Secretary, Capt. C. F. G. Crawford, Filton Aerodrome, Patchway.

Cinque Ports Flying Club, Lympne, Hythe. Hon. Secretary, R. Dallas Brett, 114, High Street, Hythe, Kent.

Hampshire Aero Club, Hamble, Southampton, Secretary, H. J. Harrington, Hamble, Southampton.

Lancashire Aero Club, Woodford, Lancs. Secretary, C. J. Wood, Oakfield, Dukinfield, near Manchester.

Liverpool and District Aero Club, Hooton, Cheshire. Hon. Secretary, W. F. Davison, 357, Royal Liver Building, Liverpool.

Midland Aero Club, Castle Bromwich, Birmingham. Secretary, Maj. Gilbert Dennison, 22, Villa Road, Handsworth, Birmingham.

Newcastle-on-Tyne Aero Club, Cramlington, Northumberland. Secretary, J. T. Dodds, Cramlington Aerodrome, Northumberland.

Norfolk and Norwich Aero Club, Mousehold, Norwich. Secretary, G. McEwen, The Aerodrome, Mousehold, Norwich.

Nottingham Aero Club, Hucknall, Nottingham. Hon. Secretary, Cecil R. Sands, A.C.A., Imperial Buildings, Victoria St., Nottingham.

The Scottish Flying Club, 101, St. Vincent Street, Glasgow. Secretary, Harry W. Smith.

Southern Aero Club, Shoreham, Sussex. Secretary, C. A. Boucher, Shoreham Aerodrome, Sussex.

Suffolk Aeroplane Club, Ipswich. Secretary, Maj. P. L. Holmes, The Aerodrome, Hadleigh, Suffolk.

Yorkshire Aeroplane Club, Sherburn-in-Elmet, Yorks. Secretary, Lieut.-Col. Walker, The Aerodrome, Sherburn-in-Elmet.

BRISTOL & WESSEX AEROPLANE CLUB, LTD.

REPORT for week ending August 25.—Total flying time, 29 hrs. 5 mins.

The ground engineer's absence and several flying members away has made it a quiet week.

'TV was taken up to Stag Lane by Mr. Traverse on Tuesday to be repainted and de Havillands with great despatch had the very smart looking machine ready on Friday morning to be flown back.

On Saturday, Capt. Barnwell, Mr. Travers and Mr. Hall took up the "Brownie," and quite a number of people enjoyed passenger flights with Mr. Bathurst in the "Moths." The landing circle is now completed and is of great assistance to members in the early stages of pilotage.

HAMPSHIRE AEROPLANE CLUB

REPORT for week ending August 24.—Total flying time, 58 hrs. 20 mins. Dual instruction, 26 hrs. 55 mins. "A" Pilots, 13 hrs. 20 mins. Solo, 4 hrs. 20 mins. Passenger flights, 11 hrs. 45 mins. Tests, 2 hrs.

Instruction with Flight-Lieut. Swoffer and Mr. W. H. Dudley : Mr. Cambell, Cdr. Tower, Mr. Dickson, Mr. Bull, Cdr. Creswell, Miss Home, Mr. Wills, Cdr. Bell, Mr. Sturge, Lt. Mandeville, Mr. Beagley, Lt. Collier, Mr. Curtis-Nuthall, Lt. Coveney, Mr. Buckley, Mr. W. S. Hall, S./Lt. Colls, Mr. Scott Hall, Mr. M. S. Hall, Mr. Wells, Mr. Goldman, Miss Melvill, Mr. Makgill, Mr. Richardson, Mr. Mattocks, Mr. Berney, Lt. Oswald, Mr. Snowden, Mr. Brewster, Dr. Bowden, Mr. Reuther, Mr. Alsford, Mr. Cator, Mr. Drury, Mr. W. Martin, Mr. Knight, Mr. T. Martin, Mr. Agar, Mr. Turner, Mr. R. H. Alsford, Lt. Roskill, Lt. Des Graz, Mr. Weekes.

"A" Pilots : Mr. Hoare, Miss Grace, Capt. Kirby, Lt. Collier, Lt. Heath, Mr. Wills, Mr. Michelmore, Mr. Wells, Capt. Bott, F./O. Hayter, Don J. de la Cierva, Mr. Parker, Mr. Sanders Clark, Lt. Fagan, Lt. Heinemann.

Soloists : Cdr. Tower, Mr. Watt, Mr. Sturge, Mr. Curtis-Nuthall, Mr. Scott-Hall, F./O. Southey.

Passengers : Mr. Colls, Miss Spooner, Mr. Neath, Mr. Barwell, Mrs. Swoffer, Mr. St. Barbe, Mrs. Michelmore, Mr. Shankland, Mrs. Shankland, Mr. Marshall, Mrs. Hutchinson, Mr. Jogden, Miss Forde, Mr. Navonoda, Mr. Carranneena, Miss Hutchinson, Mr. Bellfield, Mr. Cree, Mr. Brady, Mr. Peel, Miss Robertson, Mr. Hurn, Mr. Milford, Mr. Prentis, Capt. Duke, Mr. Coates, Mrs. Harrison, Mr. Atkinson, Miss Corlett, Mr. Audley.

We have been visited this week by Mr. S. F. St. Barbe of Skywriting fame and by Mr. H. S. Broad, who came down in the Gipsy "Moth," in which he has just made a new Light Aeroplane endurance record.

Flight-Lieut. Swoffer has been testing the Simmonds "Spartan" and he considers it the best school machine yet brought out. The forward view is excellent, the controls are sensitive and on landing the machine pulls up in a very short distance. Flight-Lieut. Swoffer is of opinion that the "Spartan" will well stand up to hard club work.

Mr. Goldman carried out his first solo quite successfully. High winds have seriously interfered with our activities this week.

ISLE OF PURBECK LIGHT AEROPLANE CLUB

REPORT for week ending August 25.—Total flying time, 8 hrs. 5 mins., dual and passenger flights. On Wednesday the "Spartan" was sent to Christchurch to return the compliment to the Bournemouth section of the Hampshire Aero Club and assist in passenger flights, which included our good friend Major March, Station Director, B.B.C., Bournemouth, who, having been a keen hunting man apparently took exception to some unflaged "wire," and our first whip being in full agreement removed same, posts and all amidst much applause. This incident rather naturally necessitated complete rebuilding of the starboard side of chassis.

Four a.m. Thursday new chassis arrived and the "Spartan" was again serviceable at dawn. Full marks Simmonds and Co. At 9.15 a.m. Mr. Banting left Christchurch for Hendon and brought the Director of Civil Aviation to Dorchester where, thanks to his, Sir Sefton Brancker's, inspiring words, the Dorsetshire Aero Club was formed with H.Q. at Dorchester, and we hope shortly three other branches like our own in the country. So there ought to be some "Good Hunting" round about Dorset next season.

The return journey from Dorchester via Worth, Matravers, Bournemouth, Hamble to Croydon with General Brancker was completed to schedule and the "Spartan" returned to Hamble at 8.25 p.m.

LANCASHIRE AERO CLUB

REPORT for week ending August 25.—The aerodrome having been closed until August 25 there is no record of flying.

Flight-Lieut. H. C. Todd will commence his duties as Instructor and Aerodrome Manager on Saturday, September 1. In the meantime Capt. H. A. Brown will officiate at the aerodrome.

LIVERPOOL & DISTRICT AERO CLUB

REPORT for week ending August 26.—Total flying time, 30 hrs. 45 mins. Dual, 24 hrs. 20 mins. Solo, 6 hrs. 25 mins.

Dual (with Lieut. Bentley) : Mrs. Naylor, Mrs. Vernon, Miss Hackforth, Miss Hill, Miss Hughes, Messrs. Keniston, Naylor, Greenhalgh, Cowan, Moulsdale, D. H. Williamson, Francis, Barber, Eills, Thornton, Willcox, Spark, Allcock, Henderson, Barker.

Soloists : Messrs. McClure, Benson, Thornton, Greenhalgh, Moulsdale, Mrs. Naylor.

Joyrides (with Mr. Davison) : Miss Dean, Miss Claye, Miss Read, Mr. Salter. (With Mr. Ward) : Messrs. Shaw, Holmes, Allcock, Barker.

This has been an eventful week. On Wednesday evening, the Autogiro 'plane arrived, and was demonstrated to a number of the Club members who were hardy enough to turn out notwithstanding the very bad weather. Everybody was most interested and a number of our soloists decided that flying will be really a pleasure when the principle becomes more universal. Lieut. Bentley turned out a good crop of soloists this week : Mrs. Naylor (the

first lady member to take the air), Mr. Moulsdale and Mr. Greenhalgh, who all put up very good shows. Mr. Naylor arrived whilst his wife was in the air, but did not develop any grey hairs. Mrs. Naylor is to be congratulated on beating her husband to it.

Mr. McClure gave an interesting display of aerobatics with the aid of XY. When a diagonal stay is fitted, the machine will be ready to fly again, and the Flying Sub-Committee is meantime thinking of printing its bye-laws in red.

There will be a party in the Hangar on Sunday evening, which we hope will develop into a very lively affair. Several soloists will no doubt celebrate, and luminous latch-keys will be the order of the evening.

MIDLAND AERO CLUB

REPORT for week ending August 25.—Total flying time, 29 hrs. 36 mins. Dual: 13 hrs. 35 mins. Solo, 9 hrs. 15 mins. Passenger, 6 hrs. 10 mins. Test, 36 mins.

The following members were given dual instruction by Flt.-Lt. T. Rose and Mr. W. H. Sutcliffe :—T. W. Wild, R. G. Welch, A. E. Coltman, D. N. Khatrie, G. P. Haylock, R. B. Laidlaw, L. H. Lee, S. Duckitt, E. D. Wynn, F. J. Steward, J. W. Astley, M. Blakeway, J. C. Williams, J. A. Ridsdale, J. Fitzgerald, D. W. Tilleke.

Soloists: E. P. Lane, J. R. Guthrie, E. R. King, J. Edwards, R. L. Brinton, J. Cobbe, E. L. Hulme, R. C. Baxter, G. C. Jones, J. Rowley, L. H. Lee, M. A. Murtagh, H. J. Willis, G. Robson, W. W. Astley, S. H. Smith, R. D. Bednell, G. E. C. Hill, H. Tipper.

Passengers: J. R. Guthrie, R. L. Brinton, Mrs. Tilleke, Mrs. Griffin, G. E. Griffin, M. C. Mander, M. Turner, C. Eckersley, J. H. Moore, R. E. Cooke, J. Hicks.

On Thursday, Mr. J. W. Astley was launched solo and put up a very good performance.

Mr. Rawson arrived on the Autogiro on Thursday and gave a very interesting display. He was good enough to give passenger flights to several members, who were quite impressed.

NEWCASTLE-UPON-TYNE AERO CLUB

REPORT for week ending August 26.—Total flying time, 24 hrs. 5 mins. Instruction, 9 hrs. 35 mins. "A" Pilots, 8 hrs. 40 mins. Solo training 50 mins. Passenger, 4 hrs. 50 mins. Test, 10 mins.

Instruction (with Mr. J. D. Parkinson): Miss Forster, Miss Yendall, Messrs. Dickinson, Foster, Sadler, Walker, Temple, Griffiths, McLean, Dr. Walker.

"A" Pilots: Mrs. Heslop, Messrs. Irving, De Pledge, Turnbull, C. Thompson, Shaw, Wilson, W. B. Ellis, Dr. Dixon. Solo Training: Mr. Sadler.

We were pleased to welcome Mr. Rawson with the Autogiro last Tuesday. He gave demonstrations of the machine in all positions and as these were carried out in a high wind, they were very impressive.

Mr. Sadler, one of our youngest members, successfully completed his first solo this week.

NORFOLK & NORWICH AERO CLUB

REPORT for week ending August 26.—Total flying time, 21 hrs.

Dual (with Mr. Young): Messrs. C. Ransom, C. Bethell, H. Neave, C. Land, D. Corsellis, C. Bouguet, G. Wharton.

Soloists: Messrs. H. Pank, E. Varden Smith, H. Neave, A. G. Marshall, R. T. Harmer, H. Cator, D. Corsellis, G. F. Surtees, F. Gough, W. A. Ramsay, R. F. Potter. Passengers, 27.

Yet another member has just completed an excellent first solo. Congratulations, Mr. Corsellis, for the good show. The weather has been somewhat bad at intervals this week and accordingly reflects on the time chart.

We have now seventeen "A" Licence pilots in the Club, and seven who have applied for their "A's" and are still waiting for them to come through. This shows how well they are taking to the air in so short a time, which, when one deducts the dud weather and all the "Machine in Dock" time, is really very short indeed. Apart from these few, there are many more under training.

NOTTINGHAM AERO CLUB

REPORT for weekending August 24.—Flying time, 15 hrs. 35 mins. Instruction, 6 hrs. 40 mins.; "A" Pilots: 35 mins. Solo (under instruction), 6 hrs. 15 mins. Passengers, 1 hr. 25 mins. Tests, 40 mins.

Instruction (with Mr. Martin): Messrs. Drakeford, Thorpe, Lazzerine, Winn, McWilliam, Cudlip, Hancock, Thirlby.

Solo "A" Licence: Messrs. Bradley, Selvey.

Solo (under instruction): Messrs. Bradley, Selvey, Hatton, Glenn, Calladine, Taylor, Chawla, Hancock.

Passengers: Miss Bowden, Miss Bure, Mr. Franklin.

It is with sincere regret that we place on record the fatal accident which occurred on Wednesday, August 22. Mr. R. A. Blake (one of our directors, and an original member of the Club) took up Lieut. W. Richardson as a passenger on "SK" and about 1 mile from the Aerodrome, the machine nose-dived and burst into flames on hitting the ground. The Club, on its own behalf and on behalf of the relatives of the two members, here records its sincere appreciation of the many telegrams and letters of condolence it has received from other Clubs.

SUFFOLK & EASTERN COUNTIES AEROPLANE CLUB

REPORT for week ending August 25.—Flying time, 18 hrs. Instruction, 7 hrs. 40 mins. "A" and "B" Pilots, 3 hrs. Passenger flights, 7 hrs. Tests, 20 mins.

Passengers, with Mr. Lowdell, 40.

Dual instruction, with Mr. Lowdell: Miss S. Edwards, Dr. Mildred Yate, T. and B. F. Marriage, R. Brown, Ogilvie, Pettiward, Read, Billington, Welsh, Hanson, Smith and Jolly.

"A" and "B" Pilots: Dr. J. C. Sleigh and Mr. C. N. Prentice.

High winds have been the order of the day throughout the week, with the result that flying time is below the normal average. There was only one day that was really fit for instruction in landings. On Friday the club, in conjunction with Mr. Edward Jones, organised a display at Clacton-on-Sea as a piece of propaganda for aviation and for the Friendship Fellowship. We are now all ancient mariners and by the time our beards have reached the desired span we hope to have our uniforms delivered.

YORKSHIRE AEROPLANE CLUB

REPORT for week ending August 25.—Flying time, 29 hrs. Dual, 15 hrs. 15 mins. Solo, 10 hrs. 25 mins. Passengers, 3 hrs. 20 mins.

Instruction, with Capt. Beck: Miss Ellison, Mrs. Cator, Messrs. Dujardin, Bamford, Lloyd, Evans, Watson, Ambler, Gill, Palmer, A. Senior, G. Senior, Ostler, Ives, Gaunt.

"A" Pilots.—Messrs. Ambler, Thomson, Humpheries, Ellison, Norway, Lax, Birch.

Passengers, 14.

On Wednesday we had an unexpected but welcome visit from Sir Sefton Brancker. Other visitors this week have included two Berkshire pilots, and Mr. Fred Holmes of that firm.

To-day we have returned "SV" to Brough for C. of A., etc., its engine having done some 250 odd hours without being touched.

FROM THE FLYING SCHOOLS

De Havilland Flying School, Stag Lane Aerodrome

REPORT for two weeks ending August 26.—Total flying time, 500 hrs. 15 mins. Instruction—dual: 176 hrs. 10 mins.; solo: 248 hrs. 35 mins. Other flying, 75 hrs. 30 mins.

As can be observed by our figures, the School has done an excellent fortnight's work and shows undoubtedly that it is the largest, most up-to-date and best organised school of flying in the world.

Our latest achievement lies in the success of elementary pupils carrying out cross-country flights in formation on "Moth" machines. Three such flights have been accomplished in first-rate style, to the great credit of both pupils and instructors.

Mr. Mohammed Roushdy, of the Egyptian Government, carried out an excellent first solo on an advanced type machine, the D.H.9J, and has since carried out other satisfactory solo flights on this type. Mr. Roushdy is, in all probability, the first Egyptian to fly an advanced type machine, and we wish him every success when he takes over his duties with the Directorate of Civil Aviation in Egypt.

Our Indian Government pupils are progressing satisfactorily, and three of them have already qualified for "A" certificates. They were reviewed during the week by Air Vice-Marshal Sir Sefton Brancker, who was thoroughly satisfied with their progress.

We have received visits from quite a number of well-known persons. Sir Alan Cobham, Mr. Levine and Miss Boll came along to fly the new "Gipsy Moth," and Mr. Levine was so attracted by it that he wanted to purchase one there and then, but naturally our large contracts rendered immediate delivery an impossibility.

Two officials of the Rotterdam Aero Club—Mr. Kolff, the President, and Mr. Schmidt Krans, the Chief Instructor—returned a visit made by various de Havilland officials at a recent flying meeting in Rotterdam. Both flew "slotted" and "Gipsy" Moths, and were greatly impressed.

Three pilots of the Genoa Flying Club came to take delivery of their first two "Moth" seaplanes and were thoroughly delighted with the School, in which they were greatly interested.

Flight-Lieut. Webster, the famous Schneider Cup pilot, flew to the Continent on a "Moth" machine, and carried out demonstrations in various places before keenly interested spectators.

"Moths" were well represented at the Hadleigh Aero Club Meeting held at Clacton on August 24. A Flying Meeting held in England without a "Moth" representative would really be most unique!!!

Besides the many "Moths" which were tested, a new D.H.61 fitted with "Slots" underwent its tests and the slots were found to be highly successful. This machine is for use on an Australian air line.

Henderson Flying School, Limited.

REPORT for week ending August 23.—Total flying time, 78 hrs. 30 mins.

Dual, with Capt. H. D. Davis: Messrs. Groner, Courtney-Bankes, Moursi, Austin, Oldmeadow, Hsiao, Stewart, Robertson, Du Cane, Dr. Forsyth, Dr. Shields, Mrs. Scott, Mrs. Monkton, Miss Kidston.

Dual, with Capt. Davenport: Messrs. May, Stewart, Miss Wellby.

Soloists; Messrs. Robertson, Groner, Du Cane, Daniels, Knox, Anderson, Oliver.

Mr. Stewart is now going well ahead and is almost ready to do his R.A.C. tests.

Mr. Courtney-Bankes and Mr. Austin are now almost ready for their first solo flights.

During the week 330 passengers were carried in our machines.

Lieut.-Col. Henderson and Mr. Anderson returned from Belfast on Friday. A week's flying was put in at Belfast from Malone aerodrome, and a field adjoining. A large number of spectators had an excellent view of the races from the air. The interest shown in aviation was considerable, and there seems to be every prospect of a light aeroplane club being started there shortly.

Aerodromes of England

These are reports from several towns on the question of municipal aerodromes :—

Portsmouth is a town alert to the need. No definite information is available at the moment as the Town Planning Committee is seriously considering proposals. It has been mentioned in the local press that a portion of land at present unbuilt upon within the city's boundaries may possibly be preserved, and it is pointed out that the time is ripe for action to be taken, for it is probable that soon there will not be land available for an accessible municipal aerodrome.

Manchester is considering several sites, and in the near future a committee will be called to discuss plans.

Liverpool, about which many ambitious reports appeared in the press on the question some months ago, has come to no decision, but is considering the purchase of 2,216 acres.

Leicester has the matter under discussion by the committee concerned, and the subject of sites is being dealt with.

Bognor realises the future necessity for some provision, but has not done any more than that at the moment.

Glasgow is not to have a municipal aerodrome. No reasons are given. We should imagine that it might be difficult to find an accessible site in the district. The Renfrew aerodrome is 5 miles west of Glasgow.

Northampton Aerodrome

A SITE for the new Northamptonshire Aero Club has been chosen at Sywell, five miles from Northampton, and approved by the Air Ministry. It is in the heart of the Pytchley country. The Prince of Wales is to be invited to be patron of the club, as he is patron of the living at Sywell, and the Duchess of Bedford is interested in the venture. There will be an inauguration next month.

AIRISMS FROM THE FOUR WINDS

Great Flying Boat Cruise

THE four R.A.F. Supermarine-Napier "Southampton" flying boats engaged on the Far East Cruise, reached Thursday Island, 10.50 a.m., on August 28.

Duchess of Bedford's Flight

THE "Princess Xenia," the machine in which the Duchess of Bedford attempted to fly to India some time ago, had a new engine installed at Bushire. After tests the flight was resumed to Karachi on August 22. The return flight from India has been temporarily abandoned, and the Duchess of Bedford is returning by boat. On the arrival at Karachi, after the long delay at Bushire, the propeller was found to be in very bad condition, which necessitated awaiting a new one. Their outward flight commenced on June 10 with the intention of reaching India in four stages. Sofia was reached on the same day, Aleppo June 11, and Bushire June 12.

French Atlantic Flight

ON a Bernard cabin monoplane (500 h.p. Hispaño-Suiza engine) Capt. Coudouret started an attempt upon the Atlantic from Paris on August 25. Apparently the machine was overloaded, for it failed to rise above some high-tension cables. Fortunately the pilot was able to dive under them, only to crash into another cable, but 300 gallons of petrol were released, and a semi-clearance made. The machine then landed, with such relief to Coudouret's companions, Capt. Mailloux and Lieut. Mailly-Nesle that they shook him warmly by the hand for his skilful piloting. Another attempt will follow with a more powerful engine.

Atlantic Airmen Missing

NOTHING has been heard of Mr. B. Hassell and Mr. Parker Cramer since their disappearance on August 16 while flying between Cochrane, Ontario, and Mount Evans Observatory, Greenland. It seems certain that the machine was seen off the Greenland coast the following morning, 300 miles to the south of the course. Search is being made along the coast.

Missing Pacific Machine

A THREE-ENGINED Ford monoplane, which left Victoria on August 25 for Seattle, disappeared with its two pilots and four passengers. It was engaged on the triangular service Vancouver–Victoria–Seattle, and was on a journey of 80 miles across Georgia Gulf, Fuca Straits, and Puget Sound. Amongst the passengers were Mr. MacCallum Scott (a former M.P.) and his wife. The pilot was Herald Walker, a veteran American airman. At the time of the flight the weather was very foggy. Oil seen on the surface has suggested a sea crash.

Italian Atlantic Airmen Crash

CAPT. FERRARIN and Maj. Del Prete, the Italian airmen who recently flew non-stop from Rome to Brazil, visited Ponta Galeao on August 7, and inspected a new Savoia aeroplane intended for a service between Rio de Janeiro and South Brazil. They expressed a wish to test the machine, and went up against the wish of the authorities. When over the sea the machine suddenly fell. Ferrarin was slightly injured and Del Prete was badly injured, and died after amputation of his leg.

Flight Across Australia

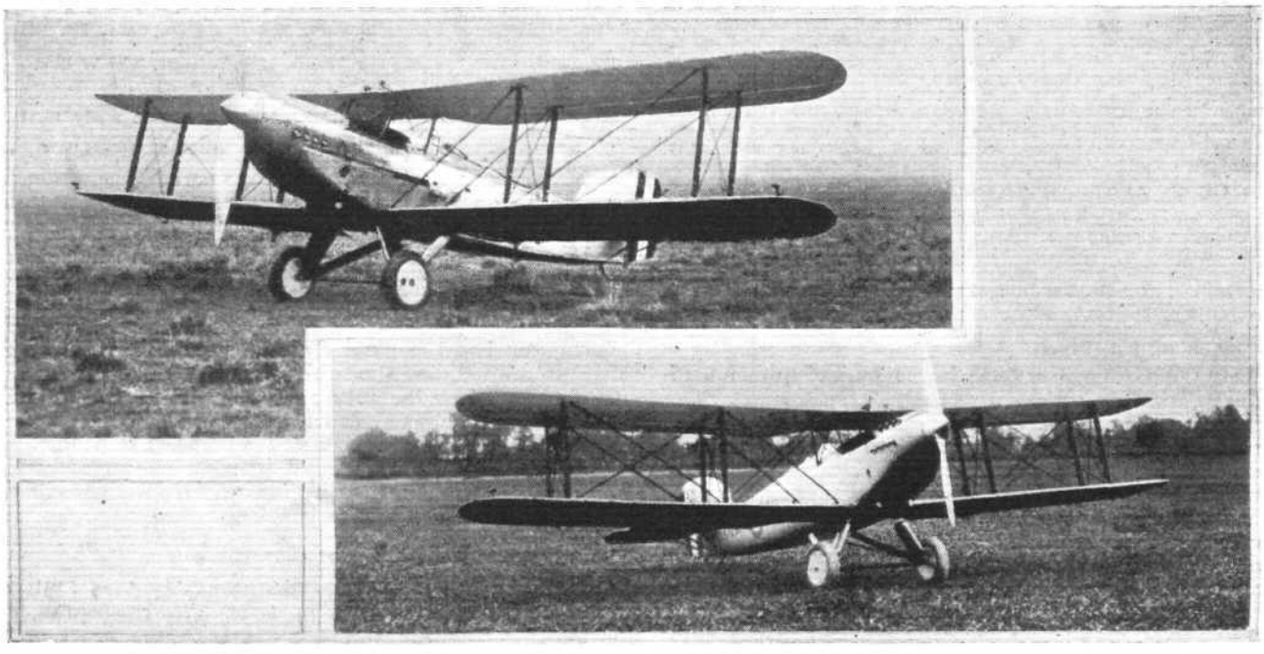
THE "Southern Cross" monoplane, which flew the Pacific this year, piloted by Capt. Kingsford Smith, flew non-stop from Tammin, West Australia, to Adelaide on August 26–27. Capt. Kingsford Smith maintained wireless communication throughout with Sydney and Melbourne, and the weather conditions were perfect. He is now preparing for a 15-hour flight to New Zealand in the same machine.

Japanese Air Lines

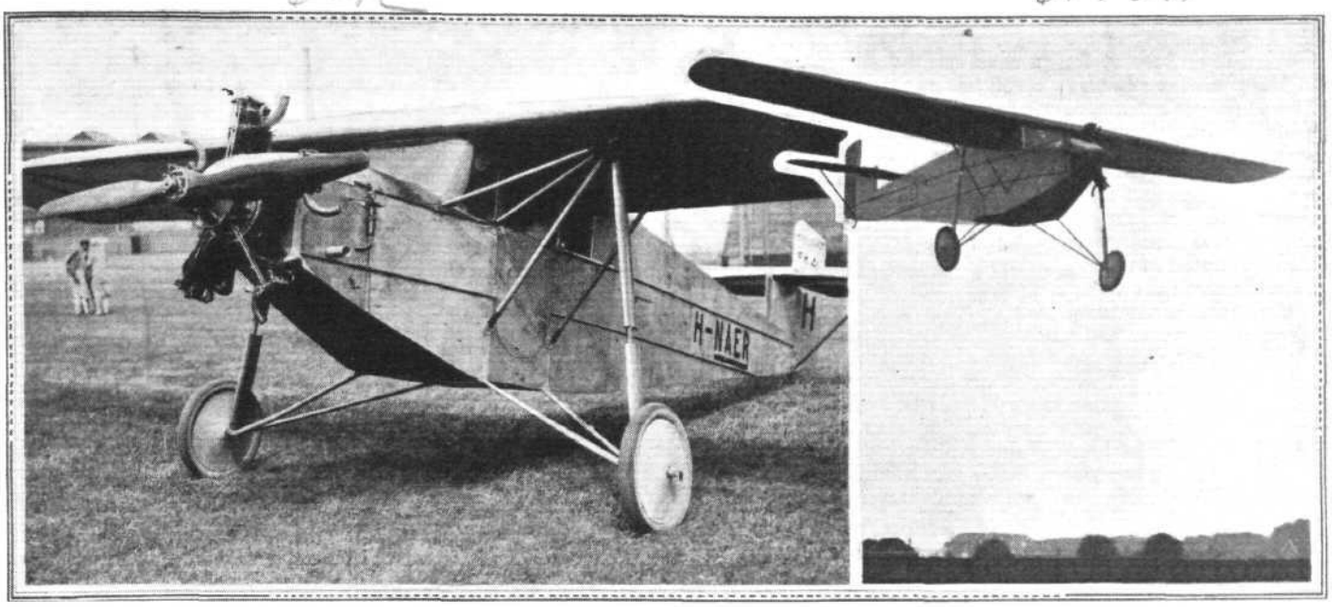
ON August 27 a Japanese air line between Tokio and Osaka was successfully started. The distance of 248 miles was covered in 2 hrs. 45 mins., and beside passengers 200 bowls of congratulatory macaroni were carried. Para machines were used, and the fare was £3 10*s*. A Government subsidy is received, but it is expected a loss will ensue. Another service has been started between Tokio and Sendai with Para machines carrying six passengers, pilot, and mechanic.

Australian-New Zealand Air Line Proposals

THE Dornier-Wal flying-boat company is reported to have put forward a proposal for a regular air service between Sydney, New South Wales, and New Zealand, a distance of 1,200 miles. The machines, all-metal flying boats, would



SCALE EFFECT! Two views of the Fairey III F (Napier "Lion"), one being of a scale *model*, and the other being of one of the actual machines recently supplied to the Irish Free State Air Force. Which is which, we leave to our readers to guess. (N.B.—No prize given.)



["FLIGHT" *Photographs*

ECONOMICAL AVIATION: The Koolhoven F. H. 41, although fitted with a Siemens engine of 50 h.p. only, carries pilot and two passengers. The machine is built mainly of wood, both fuselage and wing being covered with three ply. On the right the machine is seen in flight, piloted by M. Van Vloten.

be built at the Dornier-Wal works, but equipped with British engines, and manned by British crews. A capital of £250,000 would be drawn from English, Australian and New Zealand sources, and probably have some support from the Dornier-Wal company, although this would not exceed the proportion permitted by the Australian Parliament. At least three flying-boats would be put into commission, equipped with wireless, having a flying range of 2,000 miles and carrying 15 passengers or their equivalent in mail freight, besides a crew consisting of two pilots, navigator, wireless operator and mechanic.

South American Air Mail

AN aerial post is to be established between the interior and the ports of Ecuador and between that Republic and Colombia, by the German aerial transport company Scadta. The first official flight will be made on December 31 between Puerto, Bolivar, and Buena Ventura, which will be the first regular service commenced.

Captive French Airmen

THE two French airmen, M. Reine and M. Serre, who were taken prisoners by the Moors when they made a forced landing at Rio de Oro, are still captive, negotiations for their release having made no headway. They are in good health. Their captors are threatened with annihilation by a stronger tribe if they are released without a corresponding release of Moorish prisoners being obtained.

Missing British Explorer

IT is reported that Col. P. H. Fawcett and his expedition perished at the hands of Indians during July, 1925, five days after they had crossed the Kuluene River, in Brazil. This discovery has been made by Comdr. G. M. Dyott, who has led an expedition for the purpose of discovering the mystery of Col. Fawcett's long disappearance, and who will be remembered as an early pioneer of aviation.

Antarctic Expedition

PART of Commander Byrd's Antarctic expedition has left for the base in the Ross Sea in one of his vessels "City of New York." Aeroplanes escorted it out of New York on August 25. A second ship will sail on September 20, and Commander Byrd will sail on the third vessel, a Norwegian whaling steamer, on October 6. The expedition is said to be the most elaborate ever arranged, and to have cost £200,000.

Canadian Air Mail Services

MAILS were dropped from aircraft on the Canadian National Exhibition at Toronto on August 24. Shortly an amphibian will make a test flight from Ottawa to Vancouver under Government auspices, with a view to the ultimate opening of a trans-continental air mail line. There is already an air mail service between trans-Atlantic steamers arriving at Father Point in the Upper St. Lawrence, and Montreal, Ottawa and Toronto. Twelve to twenty hours are thus saved.

America Flown in 19 Hours

THE American pilot, Col. "Art" Goebel, accompanied by his backer, Mr. H. Tucker, left Los Angeles on August 19 and made a non-stop flight across the American continent to New York in 18 hrs. 58 mins. That lowered the previous shortest time by almost eight hours. A Lockheed-Vega aeroplane was used, and the average speed was 140 m.p.h.

Grouse by Air

THE first grouse of the season, from the Scottish moors, reached London on August 13 by air, and were served at lunch in West End hotels.

Derelict Aircraft in Atlantic

A REPORT from Cape Race, Newfoundland, stated that the British steamer *Seapool* reported that on August 12 it sighted the rudder and fuselage of a submerged aeroplane or seaplane, which was showing about 5 ft. above the water, in a position 600 miles N.E. of St. John's, Newfoundland.

Short "Mussel" Crashes

MR. EUSTACE SHORT, of Short Brothers, Ltd., crashed in the River Medway in the Short "Mussel" light seaplane on August 24. He was attempting to land across the river, and unfortunately struck the masts of a motor-boat. Mr. Short soon recovered from the shock, and assisted in salvage operations. He has been flying as a pilot for some time now, and recently flew the same machine on a tour of England.

Chancellor of Exchequer's Flight

MR. WINSTON CHURCHILL, while staying with Sir Philip Sassoon at Lympne, visited Lympne aerodrome on August 18, and was taken for a flight in a D.H. "Moth" belonging to Capt. F. E. Guest, M.P., commanding Auxiliary Squadrons, R.A.F., which were encamped there until August 19.

Courtney's Dornier-Wal Flying Boat

DAMAGE estimated at £2,000 has been done to Capt. Courtney's Dornier-Wal flying boat, which reached Montreal on August 21. Capt. Courtney is reported to be seeking Canadian financial support for a new venture.

Swiss Light Aeroplane

A CABIN type light aeroplane seating a pilot and two passengers has been designed in Switzerland by M. Alfred Comte. It is claimed that the machine has flown with the pilot and two passengers and 100 galls. of petrol. It is of metal construction, fitted with an A.D.C. "Cirrus" engine, and has a top speed of 95 m.p.h.

Sir Charles Wakefield's Gift

THE New Zealand Light Aeroplane Club is to receive from Sir Charles Wakefield the gift of a Gipsy-Moth.

Canadian Flying Clubs

THERE are now 15 Canadian flying clubs, and two more are being formed. Over 100 D.H. "Moths" are in use in Canada, half being privately owned and 30 being lent to the flying clubs by the Federal Government.

THE CLACTON AIR RALLY

ON Friday, August 24, a successful air display was held in the presence of some 10,000 spectators at Clacton-on-Sea. The organisation was carried out by the Suffolk and Eastern Counties Aeroplane Club in conjunction with Mr. Edward Jones, who has a licensed aerodrome for joy riding. Mrs. Ruth Knowles, skipper of the "Friend Ship," was also interested in the organisation and the display was made the occasion of a special appeal to the rising generation to interest themselves in the development of aviation; the idea being that the speed of air transport should help forward friendship between nations and so tend towards world peace.

Eight machines assembled at Clacton during the morning. There were two Suffolk Club "Bluebirds," piloted by Dr. J. C. Sleigh and Mr. G. E. Lowdell, the "Friend Ship" "Bluebird," piloted by Capt. Oxley Boyle, an Avro 504 piloted by Mr. E. Jones, a "Moth," piloted by Miss O'Brien, Capt. White and Mr. Holman on a slotted "Moth," Mr. Murray on a "Moth," and Mr. Cazalet on his "Widgeon."

The programme opened at 10 a.m. with formation flying over the town, this was followed by aerobatic displays by Mr. Lowdell on a "Bluebird" and Mr. Jones on a "Moth." During the morning visiting machines arrived and joy-rides were given, the first past of the day's proceedings ending with converging bombing by Messrs. Lowdell and Jones, flying a "Bluebird" and a "Moth," the targets being two solo motor-cycles and a motor-cycle combination. Several direct hits were obtained, much to the delight of the crowd. This appeared on the screen in the local cinema after the display and made a most effective picture.

At 1 p.m. the pilots and officials were given luncheon at the Grand Hotel by the organisers of the display.

The afternoon programme started at 2.30 p.m. with a grand parade and fly past, by all the assembled machines. This was followed by an aerobatic display by Miss O'Brien and formation flying by the Suffolk club machines.

A large number of passengers were carried between events, which included a very excellent demonstration of the slotted "Moth" by Mr. Holman of the de Havilland Fying School, aerobatics by Messrs. Lowdell and Jones, and more bombing.

This is the first air display to be held at Clacton, and it must be regarded as having been quite successful from the point of view of increasing airmindedness.

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"Sparkie" Sends Thanks

CAPT. SPARKS, the former chief instructor of the London Aeroplane Club, and now holding a similar position in Canada, thanks the air racing community in this country who subscribed, at Blackpool, for the cigarette box for him.

International Aircraft Exhibition, Berlin

INTENDING exhibitors from this country at the International Aircraft Exhibition, Berlin, October 7 to 28, are asked to apply for the required space immediately.

British Aviation Progress

ON August 25, nine years of civil aviation as represented by air line development between this country and the Continent, was completed. In 1919, 20 to 30 passengers were carried a week, and now the number exceeds 2,000. The first flight from London to Paris on a passenger service started from Hounslow, and a converted war type machine was used. The fare was then twenty guineas. It is now £5 15*s*. 6*d*.

Imperial Airways

IT is announced that the Directors of Imperial Airways, Ltd., have decided to recommend the payment of a dividend of 5 per cent. for the year ended March 31, 1928.

Aeronautical Publications

THE McGraw-Hill Publishing Co., Ltd., 6 and 8, Bouverie Street, London, E.C.4, will send, post free, on application, their new catalogue, No. 12, containing lists of their books on transportation, which embraces aeronautical publications.

O.R. Review

IN the June issue of the *O. R. Review*, which is published for Old Rugbeians, the Editor states that he would be glad to hear from any of his readers interested in the formation of a flying club for old Rugbeians.

He thinks that no doubt arrangements could be made for members, many of whom belong to flying clubs already, to be granted certain facilities by the present flying clubs and meetings organised from time to time. In future issues of this Review there is likely to be a page devoted to aviation.

Royal Visit to S. E. Saunders, Ltd.

S. E. SAUNDERS, LTD., of East Cowes, Isle of Wight, were honoured with a visit from their Majesties the King and Queen on August 12. A very thorough tour of the company's various shops was made, and special aircraft and marine aircraft in the course of construction were seen during the 1¼ hours' visit. Their Majesties were received by Mr. S. E. Saunders, Mr. H. S. Saunders, and Capt. Nicolson.

British Designer's Success in U.S.A.

IN connection with the new Curtiss "Chieftain" engine which we described and illustrated in our issue of June 14, 1928, we now learn that the credit for the unusual cylinder arrangement into two rows of six cylinders, placed in tandem, is due to an Englishman, Mr. A. H. Leak, A.M.I.M.E. The cylinder arrangement of the "Chieftain" has resulted in a considerable reduction in head resistance, and is believed to have other advantages. Contrary to general impression, when the cylinders of the two rows are placed one behind the other, an even number of cylinders must be used to get even firing, and Mr. Leak made use of this fact in the "Chieftain."

Before leaving England Mr. Leak was employed at the Royal Aircraft Establishment, and was also for a time with Armstrong-Siddeley Motors. He went to America in 1923, and appears to be beginning to make a name for himself there. We understand that Mr. Leak is paying a visit to England in September, and possibly we may secure from him an article dealing with the "Chieftain" engine or similar subject.

Fighting Fog

A SPECIAL study of fog as it concerns flying is to be made by the Guggenheim Fund for the Promotion of Aeronautics which has engaged a number of America's foremost pilots to experiment. It is proposed to construct special aircraft having exceptionally slow landing speeds, and to equip them with the latest devices designed to make flying through fog safer. Dangerous experiments will be continued until the object is gained, or proved to be unattainable.

New D.H. Record

Mr. W. W. WAKEFIELD, the great Rugby player, was flying in his D.H. "Moth" in North Devon late on a recent Saturday afternoon, when on landing the propeller and wing fabric suffered damage. It was 8 p.m. when he telephoned to the de Havilland Aircraft Co., Ltd. for a new propeller, fabric and dope, but within an hour the materials were on the train and reached him on the Sunday afternoon, enabling a resumption of the flight within 48 hours of the mishap.

British Trade Mission

SIR A. DUCKHAM, a director of Messrs. Alexander Duckham and Co., Ltd., who was selected to be head of the British Trade Mission to the Australian Government, left England on August 28.

Appointment

CAPT. EMORY S. LAND, Construction Corps, U.S.N., has been appointed Vice-President of the Daniel. Guggenheim Fund for the Promotion of Aeronautics, a position vacated by Rear-Admiral H. I. Cone.

Royal Air Force Club

THE club will be closed for repairs and decorations from midday on Sunday, September 2, until midday on Monday, October 15, 1928. Members will be the guests of the following clubs:—Junior Constitutional Club, from September 2; Cavalry Club, from September 3; Junior Naval and Military Club, from September 17; Naval and Military Club, from October 2. All letters, parcels, telegrams, messages, etc., usually collected by members of the club may be called for at the Cavalry Club. Other letters, etc., will be re-directed as members may require, the secretary's office being open for the whole of the period.—A. T. WYNYARD-WRIGHT (*Captain*), Secretary.

Royal Air Force Memorial Fund

THE usual meeting of the Grants Sub-Committee of the Fund was held at Iddesleigh House, on August 9. Mr. W. S. Field was in the chair, and the other member of the Committee present was:—Squadron-Leader Douglas Iron, O.B.E. The Committee considered in all 11 cases and made grants to the amount of £91 6*s*.

The usual meeting of the Grants Sub-Committee of the Fund was held at Iddesleigh House, on August 23. Mr. W. S. Field was in the chair, and the other member of the Committee present was Squadron-Leader Douglas Iron, O.B.E. The Committee considered in all 17 cases and made grants to the amount of £148 17*s*. 6*d*. The next meeting was fixed for Thursday, September 13, at 2.30 p.m.

FLIGHT
THE AIRCRAFT ENGINEER AND AIRSHIPS

THE ROYAL AIR FORCE

London Gazette, August 21, 1928.

General Duties Branch

The following flight cadets, having successfully passed through the R.A.F. College, Cranwell, are granted permanent commns. as Pilot Officers, with effect from and with seniority of July 28 :—J. T. Stephenson, F. Whittle, A. E. Dark, W. R. Worstall, C. B. Hughes, E. M. F. Grundy, J. Mutch, H. R. Dale, R. B. Councell, A. L. Weait, R. J. Cooper, L. J. Pringle, G. N. E. Tindal-Carill-Worsley, J. W. Homer, J. A. C. Stratton, R. D. Williams, L. F. Sinclair, C. Ryley, N. E. White, E. J. Lamé, J. E. Jorgensen, C. V. J. Pratt, J. J. Owen, A. Wall, R. A. Sprague, A. L. Franks, P. W. A. Dudgeon, F. P. Hewitt, J. G. Llewelyn.

Pilot Officer A. McKee is promoted to rank of Flying Officer (July 4).

Sqdn. Ldr. A. R. C. Cooper is placed on retired list at his own request (August 22).

Medical Branch

Flying Officer E. A. Rice, M.B., is promoted to rank of Flight-Lt. (August 16). Flight-Lt. C. S. de Segundo, O.B.E., V.D., M.B., B.S., relinquishes his temporary commn. on completion of service (July 25).

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The following Pilot Officers on probation are confirmed in rank :—D. H. F. Barnett, M. G. Candy, P. Drummond (August 15) ; E. Batchelor (August 16).

Flying Officer R. R. Money is transferred from Class A to Class C (August 19). The following relinquish their commns. on completion of service :—Flight-Lt. D. H. Dabbs (August 20) ; Flying Officer D. W. Forshaw (August 4).

Flying Officer C. H. E. Coles relinquishes his commn. on completion of service (June 16) (substituted for *Gazette*, July 31).

Medical Branch

Sqdn. Ldr. E. P. Punch relinquishes his commn. on completion of service (July 13).

AUXILIARY AIR FORCE

General Duties Branch

No. 603 City of Edinburgh (Bombing) Squadron.—The following Pilot Officer to be Flying Officer :—A. R. H. Miller (August 1).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

General Duties Branch

Wing Commanders : P. A. O. Leask, to H.Q., Halton, for Technical duties ; 21.8.28. G. W. Murlis-Green, D.S.O., M.C., to Aircraft Depot, India ; 29.7.28. J. V. Steel, O.B.E., to H.Q., Iraq, for Personnel Staff duties ; 17.8.28.

Sqdn.-Ldr : R. S. Aitken, M.C., A.F.C., to No. 41 Sqdn., Northolt ; 1.9.28.

Flight-Lieut. : C. K. Chandler, M.B.E., to Sch. of Photography, Farnborough ; 18.8.28. C. R. Keary, to H.Q., Air Defence of Great Britain ; Uxbridge ; 1.9.28. C. B. S. Spackman, D.F.C., to No. 8 Sqdn., Aden ; 17.8.28. H. S. P. Walmsley, M.C., D.F.C., to No. 603 (City of Edinburgh) Sqdn., Turnhouse ; 13.8.28. R. R. Greenlaw, M.B.E., to Armament and Gunnery Sch., Eastchurch ; 20.8.28. W. E. Dipple, to No. 39 Sqdn. Bircham Newton ; 3.9.28.

Flying Officer : G. R. Weighill, to No. 26 Sqdn., Catterick ; 20.8.28.

Pilot Officers : I. B. Beesley and O. G. Williams, to No. 70 Sqdn., Iraq ; 2.8.28. M. G. Sedorski, to No. 84 Sqdn., Iraq ; 2.8.28. P. W. M. Wright, to No. 30 Sqdn., Iraq ; 2.8.28. S. Pritchard-Barrett, to R.A.F. Practice Camp, Surron Bridge ; 16.8.28.

Stores Branch

Sqdn.-Ldr. : W. F. Bryant, to H.Q., Air Defence of Great Britain, Uxbridge ; 22.8.28.

Flying Officer : O. W. T. Rogers, to No. 4 Stores Depot, Ickenham ; 18.8.28.

AIR MINISTRY NOTICES

Use of Royal Air Force Aerodromes by Civil Aircraft

NOTICE to Airmen No. 57 of 1928 is cancelled and the following substituted :—

1. Attention is called to the conditions under which civil aircraft are permitted to use Royal Air Force aerodromes ; namely, in addition to landing in cases of emergency :—
   (i) For refuelling in the course of journeys where no civil facilities exist ;
   (ii) For landing of passengers proceeding to a destination near the air station concerned.
2. If it is desired to use a Royal Air Force aerodrome for more than a passing call, notice must be given to the Commanding Officer and permission obtained beforehand.
3. These conditions apply equally to aerodromes used by the Auxiliary Air Force.
4. The use of the Royal Air Force aerodrome at Gosport by civil aircraft is restricted to cases of real emergency. The civil aerodrome at Southampton (Hamble) is available nearby.
5. The Royal Air Force seaplane station at Felixstowe, as already notified, is not available for use by civil aircraft without permission.

(No. 64 of 1928.)

Pilots' Licences (Class "B") : Extension of Licences to Cover Further Types of Flying Machines

WITH reference to paragraph 81 (c) of the Air Navigation Directions, 1926 (A.N.D. 6), pilots holding licences for flying passenger or goods flying machines, who desire the extension of their licences to cover a further type of machine, will be required to carry out satisfactorily the following flying tests on the type for which the extension is required :—

(i) Three take-offs and landings with machine light.
(ii) Three take-offs and landings with full load.

In addition, applicants who desire to have a type of flying machine equipped with two or more engines endorsed on their licence will be required to undergo a test to fly and manœuvre such machine with each engine in turn completely throttled down.

They will further be required to show by an oral examination that they have a practical knowledge of the flying machine for which the extension is required, particularly with regard to the installation of the engine(s) and the functioning of the petrol, oil and water systems.

In the case of pilots employed at or flying from Croydon Aerodrome, the flying tests will be observed by the Chief Aerodrome Officer, and the examination in flying machine and engine(s) will be carried out by the staff of the Aeronautical Inspection Directorate.

On satisfactory completion of flying tests and technical examination the Chief Aerodrome Officer will make the necessary extension of the licence.

Applications for observation of flying tests, and for technical examination should be made to the Chief Aerodrome Officer when required.

In the case of pilots who are unable to attend at Croydon for flying tests and technical examination, other arrangements will be made on application to the Secretary (D.C.A.), Air Ministry.

Notice to Airmen No. 82 of the year 1922 is hereby cancelled.

(No. 65 of 1928.)

Royal Air Force Cadet College

THE following flight cadets successfully completed on July 27, 1928, their course of training at the Royal Air Force Cadet College. The names are arranged in alphabetical order :—

Cooper, R. J. ; Councell, R.B. ; Dale, H. R. ; Dark, A. E. ; Dudgeon, P. W. A. ; Franks, A. L. ; Grundy, E. M. F. ; Hewitt, F. P. ; Homer, J. W. ; Hughes, C. B. ; Jörgensen, J. E. ; Lainé, E. J. ; Llewelyn, J. G. ; Mutch, J. ; Owen, J. J. ; Pratt, C. V. J. ; Pringle, H. J., winner of Air Ministry Prize for Humanistic Subjects ; Ryley, C. ; Sinclair, L. F. ; Sprague, R. A. ; Stephenson, J. T. ; Stratton, J. A. C. ; Tindal-Carill-Worsley, G. N. E., winner of R. M. Groves Memorial Prize ; Wall, A. ; Weait, A. L. ; White, N. E., winner of Sword of Honour ; Whittle, F., winner of Abdy Gerrard Fellowes Memorial Prize ; Williams, R. D. ; Worstall, W. R., winner of Air Ministry Prize for Aeronautical Engineering.

In addition to the above, the under-mentioned flight cadet has passed the examination, but will return to the College to complete flying training : J. A. Easton.

Princess Mary's R.A.F. Nursing Service

THE first re-union dinner of Princess Mary's Royal Air Force Nursing Service will take place at the Richelieu Rooms, Hotel Cecil, Strand, W.C.2, on Friday, September 21, at 8 p.m., with the Matron-in-Chief, Miss J. M. Cruickshank, C.B.E., R.R.C., in the chair. Past members are cordially welcomed to attend, and tickets, 12*s*. 6*d*. each, may be obtained on application to Miss M. Welch, Matron, P.M.R.A.F.N.S., Air Ministry, Kingsway, W.C.2. After dinner guests may, if they so wish, join in the dancing in the Palm Court.

R.A.F. Cricket Triumph

AFTER an exciting match the Royal Air Force defeated the Royal Navy and Royal Marines at the Oval on August 28 by three wickets, and thereby became champions of the Services at cricket for this year. Earlier in the season they beat the Army, also at the Oval.

Catapult Air Mails

THE Postmaster-General announces that commencing with the despatch of the 29th instant by the S.S. *Ile-de-France* and on each future outward voyage of that ship (*i.e.*, September 19, October 10, and every three weeks thereafter), letters and postcards, registered or unregistered, for United States of America will be accepted for inclusion in a mail to be conveyed to New York by an aeroplane which will be dispatched by catapult from the ship before arrival at New York. The arrangement should enable the correspondence to reach New York about a day before the arrival of the ship. The correspondence should be posted in the ordinary way and marked "Catapult Air Mail : per S.S. *Ile-de-France*, via Plymouth." The usual air mail label should also be affixed. Latest time of posting at General Post Office, London : noon on date of dispatch. Special air fee payable *in addition to ordinary postage* ; *and registration fee if necessary* : letters and postcards, 2*s*. 6*d*. per ½ oz. If air transmission in the United States of America is also desired, the usual air fee of 9*d*. per oz. must also be prepaid (*see* Air Mail leaflet, obtainable from any post office).

AIR POST STAMPS

By DOUGLAS ARMSTRONG

(Editor of "The Stamp Collector")

Aerial developments in South America and the West Indies have already resulted in a crop of interesting new issues of air post stamps from that part of the globe, and the cry is "still they come." Following on the successful inauguration of the Latecoere trans-Atlantic air mail system, Uruguay and Chile have fallen into line with Argentina and Brazil by introducing special stamps for use in this connection. Such stamps are necessary on two counts, first in order to distinguish air-borne correspondence from that intended for despatch by ordinary routes; and second, because the operating concern receives a proportion of the total face value of the stamps affixed to the mail matter transmitted over its lines.

Chile's New Aero Stamps

A Condor with outspread wings, together with the superscription "Correo Aereo," imprinted in green, distinguishes a set of eleven contemporary postage stamps of Chile, destined for prepayment of air post fees upon correspondence between that country and Europe via Brazil and the Latecoere airways, their respective denominations being: 20, 25, 30, 40, 50 centavos, 1, 2, 3/5c., 5, 6/10c. and 10 pesos. The total issue amounts to 150,000 sets up to and including the 3 pesos on 5 c., 100,000 each of the 5 and 6 pesos, and 75,000 of the 10 pesos. It is intended to last for two months only, when it is anticipated that a definitive series of Chilean air mail stamps will be in readiness.

Latest from Uruguay

For her latest air post stamps destined for the Montevideo-Toulouse service, Uruguay has retained the curious Seagull design originally adopted two years ago, but with this difference, that the stamps themselves are perforated round the edges and lithographed upon water-marked paper. The full set of twelve values comprises:—10 centavos green, 20 c. orange, 30 c. deep blue, 38 c. green, 40 c yellow, 50 c. violet, 76 c. red-orange, 1 peso scarlet, 1·14 p. deep blue, 1·52 c. yellow, 1·90 c. violet and 3·80 p. scarlet. Ten thousand sets of the higher and thirty thousand of the lower denominations have been printed at the National Printing Establishment, Montevideo.

Short-lived Mexican Air Stamp

After a currency of only two months the initial printing of the 25 centavos air mail stamp as employed in the Mexico-Tampico air service has been withdrawn from circulation on account of the similarity in colour between it and the ordinary Express Delivery stamp, which is also printed in carmine and sepia. The new supply issued on June 20 last is in sepia and green, so that it is probable that the original issue may become scarce in course of time.

Forthcoming South American Issues

Special stamps are reported to be in preparation in Paraguay for the purpose of franking letters sent by air between Asuncion, the capital and Buenos Aires, when that service is established in the near future to connect with the trans-Atlantic system to Europe. Bolivia, Ecuador and Nicaragua are also prospective candidates for the air post collection.

San Domingo's Contribution

In connection with the recently opened West Indian Airways system linking up the islands of Cuba, San Domingo and Porto Rico, the Dominican Republic has lately provided a distinctive air mail stamp of 10 centavos, printed in blue to the extent of 100,000 copies, showing a map of the route, and with a vignette of Lindbergh's aeroplane, the "Spirit of St. Louis," inset. It is probable, by the way, that all air mail stamps may in future be printed in blue, in compliance with a recommendation adopted by the First Air Post Congress last year.

Russian-Afghan Flight that Failed

Some months ago it was reported that a regular air post service was to be put in operation between Tashkent (Soviet Russia) and Kabul. Apparently this has proved abortive, for a correspondent, Mr. J. Franklin, informs us that he has in his possession an envelope just received from Kabul and intended for transmission by this route, which, judging by the post marks, eventually reached its destination by ordinary post. Leaving Leningrad on May 12 last, it was forwarded from Moscow to Berlin on the 15th of that month, but was apparently returned to Russia, and finally proceeded by way of Basra, Karachi and Peshawar until it arrived in Kabul about the middle of June. It would appear from these dates that the cover was actually flown over certain stages of the route, but not all the way.

PERSONALS

Married

GROUP CAPTAIN WILLIAM FOSTER MACNEECE FOSTER, C.B.E., D.S.O., D.F.C., of Castle Cary, Co. Donegal, British Air Representative at Geneva, was married, on August 14, at St. Peter's Church, South Weald, to JEAN, daughter of Mr. and Mrs. RALPH W. BRUCE, of Langtons, South Weald, Essex.

ON August 18, at Highbury Congregational Church, Cheltenham, the marriage took place between FRANK RADCLIFFE, B.Sc., A.R.Ae.S., younger son of Wm. Radcliffe, of Burnley, Lancs, and EMMELINE GREENWOOD, M.Sc., younger daughter of J. H. Greenwood, of Todmarden, Yorks.

To be Married

The engagement is announced of Flying Officer RICHARD HUGH BARLOW, R.A.F., elder son of Col. Sir Hilaro W. W. Barlow, Bt., C.B., C.M.G., and Lady Barlow, of Thruxton, Andover, to ROSAMUND SYLVIA ANDERTON, younger daughter of the late Mr. F. S. Anderton and Mrs. Temple, wife of Lt.-Col. R. D. Temple, D.S.O., of Hyde Hall, Great Waltham.

The engagement is announced of CAPT. WILLIAM F. TREHARNE JAMES, late Glamorgan Yeomanry and R.F.C., eldest son of Mr. and Mrs. Frank Treharne James, of Penydarren House, Merthyr Tydfil, and Miss BARBARA GRACE PUNTAN, youngest daughter of the late Mr. Archibald John Puntan and of Mrs. Puntan, of Craig Eithen, Caswell, Swansea.

The engagement is announced between Flight-Lieut. REGINALD PYNE, D.F.C., R.A.F., youngest son of the late Mr. William Pyne, of Reading, and Miss AGNES KATHLEEN HAIG, daughter of Mr. and Mrs. H. E. Haig, of Clayton, Dairsie, Fife.

An engagement is announced between Sqdn.-Ldr. THOMAS FREDERICK WAILES THOMPSON, D.F.C., R.A.F., son of the late Mr. Christopher Thompson, and of Mrs. Thompson, The Priory, Lyncombe Hill, Bath, and Miss LORNA MARY HELMS, daughter of the late Capt. and Mrs. P. T. Helms, of Sydney, Australia.

PUBLICATIONS RECEIVED

Aeronautical Research Committee Reports and Memoranda: No. 1140.—Notes on Performance Testing. By H. L. Stevens and A. E. Woodward Nutt. Feb., 1928. Price 6*d.* net. *No.* 1145.—Wind Tunnel Tests on a R.A.F.15 Aerofoil with Pilot Planes. By F. B. Bradfield and K. W. Clark. Oct., 1927. Price 1*s.* net. H.M. Stationery Office, Kingsway, London, W.C.2.

Department of Overseas Trade: Report on Economic Conditions in the Serb-Croat-Slovene Kingdom (Jugo-Slavia), dated May, 1928. By E. Murray Harvey. H.M. Stationery Office, Kingsway, London, W.C.2. Price 1*s.* net.

Gentlemen Prefer Aeroplanes: By E. F. Spanner. E. F. Spanner, 9, Billiter Square, London, E.C.3. Price 35*s.* net.

NEW COMPANY REGISTERED

BRITISH CADASTRAL AND TOPOGRAPHIC AIR SURVEY CO., LTD., 36, Basinghall Street, E.C.2.—Capital £5,000, in £1 shares. The objects are to adopt an agreement with Brig.-Gen. Sir Charles Delmé-Radcliffe, D.S.O., C.B., C.V.O., to carry on in any part of the world the business of surveyors, explorers, photographers, map makers and designers in all its branches, particularly by means of aeroplanes, airships, balloons and aircraft of all kinds, printers, publishers, book and map sellers, etc. First director, Sir Charles Delmé-Radcliffe (permanent managing director).

AERONAUTICAL PATENT SPECIFICATIONS

(*Abbreviations:* Cyl. = cylinder; i.c. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

APPLIED FOR IN 1927

Published August 30, 1928

9,101. R. P. PESCARA. Air-compressors. (294,967.)
18,034. J. G. NAVARRO. Landplanes, seaplanes, flying boats, amphibians, etc. (295,114.)
33,529. O. KRELL. Rotatable hangars for airships. (295,170.)
35,107. Y. VAN HONACKER. Flying machine. (295,177.)

APPLIED FOR IN 1928

Published August 30, 1928

1,129. ROHRBACH METALL-FLUGZEUGBAU GES. Means for regulating the fuel supply to i.c. aircraft engines. (283,532.)

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